November 1962

Agriculture

Vol. 69 No. 8

SELECTED CONTENTS

Published for the Ministry of Agriculture, Fisheries and Food by Her Majesty's Stationery Office

1s. MONTHLY

Agriculture

VOLUME 69 · NUMBER 8 · NOVEMBER 1962

Editorial Offices
Ministry of Agriculture, Fisheries and Food
Whitehall Place, London S.W.1. Trafalgar 7711

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SUPERSEDING EARLIER ANTHELMINTICS

Thibenzole

FACT: 95-100% destruction of worms

FACT: Remarkable degree of safety— no ill-effects even at 20 times the recommended dose

FACT: Non-staining, easy to use

THIBENZOLE will undoubtedly become the standard treatment for roundworm in sheep. THIBENZOLE has a remarkably wide margin of safety and at the same time attains an excellent degree of control. THIBENZOLE kills both adult and immature worms, thus prolonging the effects of dosing and encouraging rapid growth in younger stock. Substantial independent evidence confirms the safety and efficacy of this new product . . . which is non-staining, non-corrosive, safe to handle, easy to use.

Many trials have shown a significant increase in growth in animals treated with ***THIBENZOLE****, resulting from control of both young and adult worms in all important species.*

Thibenzole *(Thiabendazole) is presented as a dispersible powder*

DOSES PER PACK	LAMBS	HOGGS	ADULTS
10-oz. powder (water-dispersible)	168	84	56

'Thibenzole' will be available at a later date as a ready-to-use suspension

INTERNATIONALLY ACCLAIMED

Britain "Experiments involving . . . 1143 sheep . . . have shown that Thiabendazole is a non-toxic, efficient gastro-intestinal nematode anthelmintic for sheep in Great Britain which is superior to other anthelmintics in general use . . ."

Private communication from Veterinary Science Division, Boots Pure Drug Co.

Australia " . . . superior to any anthelmintic for sheep nematodes yet seen in this country"

Hebden, S. P., *Aust. vet. J.*, 37, 264 (1961)

New Zealand "None of the lambs drenched with thiabendazole showed any sign of wool staining. This is a great advantage as the staining of wool by phenothiazine is a serious industry problem"

Cairns, G. C. *N.Z. vet. J.*, 9, 147 (1961)

America "Thiabendazole . . . [at recommended dosage] removed . . . 98% of worms . . . Thiabendazole was especially effective in removing immature parasites"

Cuckler, A. C., *J. Parasit.*, 47 (Suppl.), 36 (1961)

Australia "In toxicity trials 4 to 20 times the 50 mg/kg dose of thiabendazole used in these trials produced no toxic effects in 127 sheep tested"

Hebden, S. P., *Aust. vet. J.*, 37, 264 (1961)

Veterinary Division, Merck Sharp & Dohme Limited, Hoddesdon, Herts

SPROUTING POTATOES

SPROUTING seed for maincrop potatoes is becoming increasingly popular. This is particularly so on the larger farms of East Anglia.

There is nothing new in the technique of course. Some potatoes were sprouted 'in boxes in barns' in the Boston district as early as 1830. Later, sprouting was more often carried out in glass chitting houses, especially for the siltland potatoes around the Wash.

In the last ten years there has been another development—the use of fluorescent lighting. Glasshouses are costly to construct and maintain, and we seem to be going back to 'boxes in barns'.

Besides resulting in earlier tuber initiation, sprouting gives higher yields, especially when the growing season is restricted by late planting or by early blight. Also, the gaps caused by diseases such as skin spot or dry rot can be greatly reduced—a real advantage in a year like 1962.

Experiments on the yield response of maincrops to sprouting have been confined largely to the few popular varieties, but an average of an extra two tons of ware per acre seems likely, especially with King Edward. The most suitable management during sprouting depends on the variety; they are working on this at the Terrington Experimental Husbandry Farm.

Like other things in farming, sprouting potatoes calls for extra capital and skill. The former for sprouting boxes and for the adaptation or construction of a building; the latter for supervision. But the extra effort and cost is usually repaid many times over.

Mr. Tilley, of the Ministry's Agricultural Land Service, discusses the kind of houses suitable for potato sprouting on page 393.

Systemic Insecticides and Sugar Beet Yellows

R. A. DUNNING

SYSTEMIC insecticides delay and decrease the incidence of sugar beet yellows by controlling the aphids that transmit the virus causing the disease. The earlier a beet plant is infected with yellows, the greater is the loss of yield. So to avoid heavy losses, it is prevention of early infection that must be aimed at.

Both green and black aphids can bring yellows into the crop, but the green are invariably the more important. They begin to fly from various over-wintering places at the end of March, but the main flight is usually in May and early June. Some of these aphids will be carrying yellows virus and are likely to infect susceptible plants on which they feed. For a time the aphids probably move from plant to plant, depositing their young on them, but eventually they settle down and do not fly again. The aphids gradually lose the virus, so the likelihood that they will infect each subsequent plant decreases. Their offspring are wingless and may stay put or move to other plants to mature soon and produce young themselves.

The originally-infected beet plants show yellows in two or more weeks or so and are then a potent source of infection, especially as they are likely to be infested with aphids. Thus, after initial introduction from sources outside, the disease spreads within the crop, and only later in the season is there likely to be much additional infection arriving from outside.

How aphid control decreases yellows

With most systemic sprays, contact effect is not likely to last more than a few hours, whereas the systemic action can last two to three weeks. Even on frequently-sprayed crops most aphids are killed by insecticide taken up during feeding, and in the process of feeding they may infect the plant with yellows. Spraying cannot prevent these primary infections, but it does stop the infective aphids from feeding on more than one or two plants, and, more important, from producing colonies of young aphids that will spread the disease quickly within the crop in midsummer.

Some growers have complained that despite spraying when advised by the local sugar factory their beet crop shows a good deal of virus yellows later in the season. If they had left an untreated piece for comparison, the value of spraying would have been obvious in mid-season.

The following figures of yellows incidence and yield in field trials show the value of spraying:

Broom's Barn, Suffolk, 1960

	Percentage of plants with virus yellows				Cash value of crop per acre
	1 July	20 July	11 Aug.	12 Sept.	
Sprayed	0·6	5·5	44·8	99·6	£90
Unsprayed	2·2	26·4	94·8	100·0	£71

Holbeach, Lincs, 1961

	28 June	27 July	18 Aug.	6 Sept.	2 Oct.	
Sprayed	0·1	5·5	24·0	46·1	55·9	£139
Unsprayed	0·1	48·2	87·0	89·8	92·6	£113

At Gleadthorpe Experimental Husbandry Farm in 1961 the increased value of crop from spraying was even larger, because not only was yellows well contr[illegible] in July, but so also was the severe direct damage from a very heavy a[illegible]on while the plants were suffering from drought:

	7 July	18 July	27 July	21 Aug.	4 Sept.	
Sprayed	—	11·5	25·7	57·9	87·7	£93
Unsprayed	2·6	23·3	89·3	97·5	100·0	£53

In these three trials the decrease of yellows incidence during the season as a whole was 30 per cent, 60 per cent and 34 per cent: 35 per cent is the average of many trials in different years testing a single spray of a good systemic insecticide on crops heavily infested with aphids which, left uncontrolled, gave moderate to severe yellows.

Spray warning system

Trial results such as those above in the mid-1950s, and the need to advise growers if and when to spray, led to the development of the spray-warning system operated by the British Sugar Corporation's agricultural staff. Factory agriculturists issue warnings to growers advising spraying with a systemic insecticide, on the basis of daily aphid counts made by fieldmen and much general background plus local knowledge of yellows sources and the way in which infestations are likely to develop. When the infestations are prolonged, further spraying may be advised. There were a good many aphids early in 1957 and yellows threatened the crop, but growers were slow to take the advice to spray. Much of the spraying was too late and much of the possible benefit lost. But spray warnings were heeded in 1958 and subsequent years, and the following annual totals of 'spray acres' illustrate both the extent of the need for spraying each year and the growers' response: 1958: 106,000; 1959: 570,000; 1960: 272,000; 1961: 458,000; 1962: 85,000 approximately.

Recommended sprays and their limitations

Of the persistent systemic insecticides on the market, demeton-methyl ('Metasystox') was introduced first and has stood the test of time well; it is the quickest in action and shows average persistence. Phosphamidon ('Dimecron') has given more variable results, behaving excellently in some trials but rather poorly in others. Both materials are toxic enough to demand protective clothing and extra care when handling the concentrate. Dimethoate ('Rogor') is safer and no such precautions are obligatory; some users find its smell less objectionable than that of demeton-methyl but, on the average of many trials, it is not quite so good as the latter in controlling aphids and yellows and increasing yield—the difference is small and unlikely to be noticeable in the field. Menazon ('Saphicol') is a new material of considerable promise; it is one of the safest insecticides on the market, more so than DDT, and no protective clothing is necessary when handling it. Menazon acts more slowly than the three systemics previously mentioned, but is more persistent; it is also less harmful to beneficial insects than the others with the overall result of an approximately equal decrease of yellows incidence and increase of yield to that given by demeton-methyl. Results of field trials testing these and other aphicides were given in the March, 1962, issue of the *British Sugar Beet Review*.

Newly-applied systemic insecticides usually kill aphids quickly, but their persistence differs– the longer it is the better. Short-persistent materials such as mevinphos ('Phosdrin') cannot be recommended. And materials such as DDT and BHC that are sometimes used to control aphids on other crops must not be used on sugar beet, since there is the risk of killing the aphid parasites and predators usually present more readily than the aphids, doing thereby more harm than good. All these insecticides suffer from the following disadvantages. In commercial spraying the value of the insecticides falling on the soil is insignificant—only that staying on the plant is absorbed to act systemically. When the plants are small and growing rapidly, the effective persistence of the insecticide is short. On the other hand, when aphid control is necessary on large plants in late June or early July it is virtually impossible to get the spray to penetrate thoroughly into the curled hearts of the plants where the aphids are; nor can translocation within the plant be relied on to make these leaves toxic to aphids.

How plants absorb systemic insecticide from sprays applied under differing physical conditions is imperfectly understood; the turgid leaf of an actively-growing plant in May differs greatly from the wilting leaf of a drought-ridden plant in early July. Moreover, gallonage of spray applied per acre, droplet size, temperature and humidity can all affect the insecticide's efficacy. These problems are being studied, but fresh approaches are also being made to improve the action of existing insecticides and to find ways of protecting the plant when it is too small or too large to be sprayed effectively.

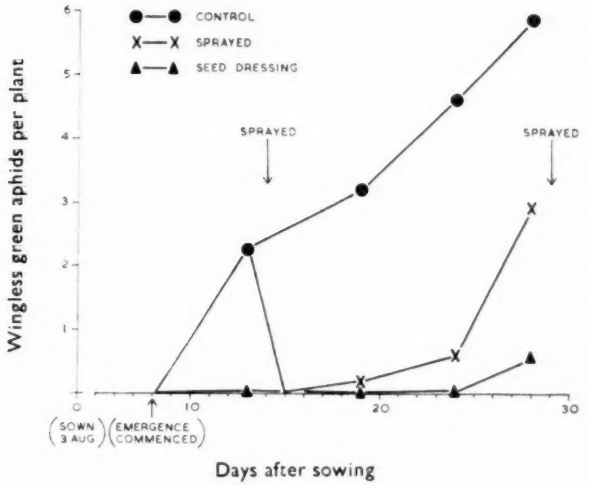
Current research — seed treatment

The development of a systemic aphicide that could be used to treat sugar beet seed has been a possibility for some years. Several insecticides have proved fairly effective, but all were too poisonous for use on a practical scale and most impaired germination and early growth of the seedlings. Disulfoton ('Disyston') and phorate ('Thimet') have both been tested extensively in this

country and been discarded on these two scores, but they are being used on other seeds in other countries.

Menazon shows promise of solving the problem. It is an extremely safe insecticide to handle and so can be used as a seed treatment on a commercial scale. The risks of phytotoxicity seem small and trials over two years with different seed varieties and soil types suggest only slight delay in germination on some soils. The results of eight field trials in 1962 show only insignificant decreases in seedling numbers, and this slight disadvantage can very probably be overcome with further work.

The first good evidence of the value of menazon seed treatment in controlling early aphid infestation on sugar beet seedlings is being obtained from a trial on sugar beet stecklings sown on 3rd August, 1962. Plots sown with menazon-treated seed are being compared with other untreated plots, some of which were sprayed with demeton-methyl shortly after plant emergence. The graph shows the results at the time of writing (September):



Winged green aphids from many sources colonized the untreated seedlings immediately on emergence from the ground and, although plots were sprayed as soon as the rows were just visible, the stecklings then bore more than two wingless green aphids each, in addition to some winged ones and both winged and wingless black aphids.

Spraying controlled aphids completely but, as expected, persistence was short in the rapidly-growing plants. On the other hand, seed treatment controlled wingless aphids almost completely and winged aphids well throughout the period. At the end of August, one month after sowing, many of the plants were already expanding their second pair of rough leaves and the effect of seed treatment cannot last much longer. However, the plants are now large enough for a standard spray to persist well.

The machine is placing insecticide granules into the soil alongside growing plants

Young, rapidly-growing, sugar beet is highly susceptible to aphid infestation and the consequent risk of yellows infection. This trial clearly demonstrates the value of treating seed with menazon to control aphids during the early stages of growth, but the degree of yellows control achieved, the ultimate object of the treatment, will not be fully known until June, 1963.

Seed treatment will also be of value to the root crop for later drillings in areas where aphids and yellows usually occur early in the season; field trials in 1961 demonstrated that yellows could be alleviated to some extent by such treatment, and this will be tested again in 1963.

— granular insecticides

Sprays control heavy aphid infestation poorly on large sugar beet plants, but excellent results were obtained in the U.S.A. with a granular form of some systemic insecticides applied so as to tumble down into the hearts of the dry plants. Disulfoton and phorate granules were tested in Britain, and a top dressing applied in a band over the plant row controlled aphids very well. The results of three years' field trials led to the conclusion that one such treatment approximately equals two spray applications of demeton-methyl in decreasing yellows and increasing yield. Combination of granule application with steerage hoeing is an advantage, and both disulfoton and phorate are now available for growers' use.

How the insecticide in the dry granule acts is not fully understood. Immediately after application there is likely to be some local fumigant action, especially in the heart of large plants. The plant can also absorb the insecticide from granules lodged on the leaves and at the bases of the leaf stalks, and aphids start to die within forty-eight hours of application. Presumably rain or dew improves the speed of action. The roots can absorb insecticide from

granules falling on the soil surface below the plants if rain washes it in. The efficiency of top dressing with granular insecticide increases with increase in plant size.

The ability of granules applied to the soil to protect small plants from aphids and yellows is being tested. The sowing of menazon granules together with the seed is likely to give longer protection than does a seed treatment, because more insecticide can be applied per length of row. Disulfoton and phorate are too poisonous to the young seedling for use in this way, but a sufficient amount broadcast and worked in before drilling decreases yellows and increases yield well. But this is not possible commercially. Trials are therefore now testing placement of granules into the soil alongside the growing plant at the time of steerage hoeing. The picture opposite shows such an application in progress—a standard steerage hoe frame is used but the blades have been removed from this experimental set-up. A commercial applicator is being used to meter insecticide granules through flexible pipes into the bottom of a slit made by a modified plough knife-coulter. In this way granules can be placed 2–3 inches deep and the same distance from the plants. Timing of application is flexible. Experiments are in progress comparing such a treatment, usually at steerage hoeing before singling, with standard application of sprays or granules to the foliage when the first aphids are found in the crop.

THE AUTHOR

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The Pounds, Shillings and Sense of Horticulture

W. JOHN WRIGHT

To many people the uncertainty of our climate and lack of guaranteed prices for horticultural produce make it seem impossible to hope for success with horticultural management. There is no doubt that, for this and other reasons, the principles of economic management, which have been applied with such conspicuous success in agriculture, are more difficult to apply to horticulture, but they are still valid and will play an increasing part in the running of growers' holdings in the competitive conditions ahead.

Some of the difficulties

Few organizations have collected economic data about the wide range of crops grown, so it is not surprising perhaps that horticulture has lagged behind agriculture in taking up the idea of management based on economics. Of course, no amount of juggling with figures will offset the lack of technical knowledge in growing crops, but for the skilful grower the keeping of some financial details to back up the physical data about the holding can be a great help in planning future production.

It might seem that the vagaries of the weather and uncertainties of marketing would make it impossible anyway to relate the financial returns of one year with those of the next. It would be idle to pretend that the weather does not have a large influence on crop weights, but these are often compensated by changes in price to give a remarkably consistent return from one year to the next. In some years certain crops can be a complete failure, but this is generally offset by better returns than expected from others to make forward budgeting quite feasible.

How successful it can be a young grower, Mr. David Martineau, has found on his holding near Tewkesbury in Gloucestershire.

Building up a new holding

The development of his intensively-managed seven acres began in 1955. Before then, Mr. Martineau had been working for other growers for a number of years to gain wider experience, and had been searching the West Midlands

for a suitable piece of land to start a holding of his own. Finally, he settled on five acres of derelict plum orchard at the south-western tip of the Vale of Evesham, on a poor, light soil and with a slight slope to the south. He has exploited this early position by heavy manuring, by installing irrigation and forwarding his crops with glass protection. He has concentrated on high return crops and earliness, so that he is generally assured of a good demand for his produce at the thrice-weekly auctions of the Gloucestershire Marketing Society, held at Cheltenham.

He soon began to take an interest in the returns from individual crops, and by 1957 was beginning to look for a minimum gross return of £400 per acre from each one. At that time, the glass on the holding comprised a Dutch light structure of $\frac{1}{5}$ acre, with a further $\frac{1}{10}$ without roof lights, so that a third of the whole could be weathered each winter. He had 1,200 yards of cloches, and his crops included lettuce, runner beans, marrows, melons, sweet corn, self-blanching celery, early summer cabbage and cauliflower—all with glass protection at some stage if not throughout their lives. In the structure were tomatoes, lettuce and celery (unprotected) and outdoors, spring cabbage, lettuce, leeks and beetroot.

Beginning of management advice

Mr. Martineau wanted a plan to guide further expansion. He wanted some criterion by which to select the crops he should grow and how much of each, and what he ought to spend in so doing. He decided to see whether management advice could help. This led to a visit by Dr. E. B. Fekete, of the Agricultural Economics' Department of Bristol University. Dr. Fekete had been collecting details of costs and returns on a number of holdings in the Vale of Evesham for some years. He started with the figure for total revenue from the holding for the previous season, and was able to suggest the proportions which should have been spent on labour, seeds, sprays, to leave a margin of profit of about 20 per cent. He was also able to compare the 'per acre' returns for the crops Mr. Martineau was growing with those of other growers. Looking ahead, he confirmed the ideas which Mr. Martineau was already forming as to what

Mr. Martineau inspects a lettuce crop on his holding

General view of late-struck chrysanthemums in the Dutch light structure

crops were unlikely to reach a turnover of £400 per acre. He was also able to suggest those which might profitably be grown on a larger area, subject to the overriding consideration of labour availability.

Working to a plan

Early in the 1959 season, Mr. Martineau had the two forms already described by Dr. Fekete*, with targets for the amounts he should get back from each crop on the Revenue sheet and the totals he ought to spend on the various cost items on the Expenditure sheet. It was a dry season in 1959, and this tended to keep down crop weights while maintaining prices. It was the sort of season when salads are in demand, and Mr. Martineau departed from the planned successional crops to concentrate on sowings of lettuce. How right his judgment was may be gathered from the returns which totalled £1,343 from outdoor lettuce as against the target figure of £300. The other fact which gave a higher margin than budgeted for in that year was the cutting of costs to nearer the standards for his type of holding. The management income per acre was 23 per cent higher than estimated. This was the difference between revenue plus closing valuation and expenditure plus opening valuation.

By the beginning of the 1960 season, with experience backed by figures dating back to 1956, the crop returns on which Mr. Martineau based his budget were being related more to his past performance, with less account of outside standards. That was the last year in which he grew early summer cauliflower, for example, because that was the third season in which they failed, under his conditions, to reach the minimum return of £400 per acre, although the standard for the crop on other holdings was about that figure.

During the year he erected more glass and completed the replacement of cloches by Dutch lights; additional land was bought, bringing the total up to 7 acres, and about 30 per cent of this was double cropped.

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* See Dr. Fekete's article 'Planning in Horticulture', *Agriculture*, September, 1962.

In 1960, the revenue from the glass-protected crops was better than anticipated and again, after Mr. Martineau had paid himself a wage, his management income was 92 per cent more than the conservative estimate at the start of the season.

At the beginning of the 1961 season Mr. Martineau simplified his cropping still further by eliminating spring onions and stick beans as well as cauliflower, to make way for a new venture—strawberries. These were planted at the end of 1960 and were intended as an annual crop, to be ploughed in after the first harvest. For the first year the anticipated return from strawberries was set at a lower than average figure to take account of his inexperience with the crop.

The following figures show some of the results for the year.

	Revenue (expressed on a 'per acre' basis)				Expenditure (expressed as % of Revenue)		
	Budget	Actual	Difference		Budget	Actual	Difference
Tomatoes	3,666	5,000	+ 1,334	Labour (incl. self)	40	31	− 9
Chrysanthemum	2,750	2,486	− 264	Seeds, etc.	5	4	− 1
Crops under frames	2,270	1,623	− 647	Fertilizers	5	3	− 2
Lettuce under glass	2,200	2,827	+ 627	Fuel	5	5	
Strawberries	675	1,110	+ 435	Depreciation	6	6	
Radish	600	536	− 64	Commission	10	9	− 1
Self-blanching celery	600	564	− 36	Rental value	5	4	− 1
Lettuce outdoors	500	448	− 52	Packing materials	2	4	+ 2
Summer cabbage	300	603	+ 303	Other items	5	7	+ 2
Spring cabbage	200	182	− 18		83	73	

In 1961 the management income was 67 per cent more than anticipated.

The aim each year has been to show a return of about £250 for each £100 spent in labour.

Simplification

When the returns per acre from each crop begin to fall into a consistent pattern it is natural to want to increase the areas down to the more profitable ones. But this accentuates the peaks of labour demand, as has been demonstrated during the 1962 season when harvesting the increased area of strawberries. To overcome this and enable him to concentrate on growing fewer things better, Mr. Martineau intends to simplify his cropping. Only by knowing as much as he does about the financial performance of his crops is he able to select the most profitable ones and to assess accurately the effect of this simplification on his margin.

The other change will be that selection of what crops to grow will be made on a gross margin as well as on a gross revenue basis. The latter suited his purpose in the early years because it worked without too many records. Now that he is used to keeping his present ones, he is prepared to keep more detailed costs for selected crops to compare with the figures being produced by the N.A.A.S. and other sources.

Many growers are wary of horticultural management because they believe it involves keeping very detailed records. While these would be valuable, simple details of revenue and expenditure are a most useful starting point to management, as this holding illustrates. On other holdings, however, a more comprehensive system of costing may be required.

I am greatly indebted to Mr. Martineau for allowing me to quote so freely from his accounts.

W. John Wright, B.Sc.(Hort.), N.D.H.(Hons.), the son of a Leicestershire farmer, is a Horticultural Advisory Officer in the N.A.A.S. at Gloucester.

When it is remembered that good quality grass can save the concentrates bill, it is clear why it is worth while

Keeping an Eye on Grass

J. A. Bancroft-Wilson

INTEREST in the farm management techniques evolved by agricultural economists has developed rapidly in the last five years and more and more farmers are asking for guidance on the business aspects of farming. Grassland remains the weakest link in management, and this can be attributed very largely to the difficulty in supplying input and output data which is sufficiently reliable to form a basis for forward planning.

Attempts to distinguish between grass grown and grass utilized (i.e., turned into saleable products) have been confused, and the views expressed by various authorities on the value of the techniques used have not helped. Most differences in opinion about grassland recording can be reconciled when the aims and objects of a particular scheme of recording are understood.

Value of Utilized Starch Equivalent

The basis of Fisons Grassland Recording Scheme is utilized starch equivalent (U.S.E.)—the method recommended by the British Grassland Society in 1955. This system takes account of the numbers of stock carried on the grass and the milk produced. By the use of standard feed requirements, this information is converted into starch equivalent and a deduction is then made for concentrates and any other supplementary feeding while the animals are at grass.

Utilized starch equivalent may not always reflect the amount of grass a field has produced, but it does give an estimate of the *effective* contribution made by the field to the farm economy. The main criticism levelled at the U.S.E. method of recording is that it credits supplementary feed with its full theoretical feeding value (for example, that 4 lb concentrates gives a gallon of milk) regardless of whether this feed was necessary or not. This criticism would be valid in a survey designed to examine the relative value of grass and concentrates, but in the Fisons Scheme this is not the object. This scheme

aims at studying systems of grassland farming as they are practised on commercial dairy farms, and U.S.E. is the best method so far devised of measuring the contribution of grassland to the farm economy.

The interpretation of grassland records is not always straightforward. The methods used to allocate grazing between one field and another may in some cases inflate the yield of one field at the expense of another. It is, however, generally possible to decide which fields these are and to allow for this in making comparisons. On the other hand, if a field shows itself to have an unexpected yield, whether high or low, it is important to find the reason, rather than dismiss the result as unreliable. Given these limitations, the results from grassland recording can be a useful guide in grassland management, particularly to groups of recording farmers who can pool their experiences. This approach is already being followed successfully in several grassland societies.

Aid to the research worker

Besides its value on recorded farms, grassland recording gives the opportunity of studying grassland productivity under commercial farming conditions. From the records of a large number of fields it is possible, for example, to measure the yields obtained at different fertilizer rates. This information cannot be used by itself to determine the best rates to apply, since it is never possible completely to separate the effect of the fertilizer from all the other factors which influence yields.

It could, for example, be claimed that the higher fertilizer rates are applied by the more skilful farmers and that the apparent effect of the fertilizer is due partly to the better grassland management that goes with it. On the other hand, any tendency for this to occur is much reduced by the emphasis on field by field, rather than farm by farm, comparisons. The part that grassland recording can play in investigational work is in confirming the results of experiments or indicating problems which require a solution, and some apparently consistent features have already been found in the records which need further study before they can be explained satisfactorily.

Nitrogen and yield

The results from the first year's recording* showed that while small applications of nitrogen gave worthwhile increases in yield of U.S.E., fields receiving rather higher rates yielded no more. This result can probably be explained by the absence of rain during the greater part of the summer of 1959, when any fertilizer applied after the initial spring dressing was ineffective. In the two subsequent seasons, when the rainfall was much greater, the most productive fields were generally those receiving in the region of 80 units of nitrogen. Just above this rate an apparent fall in yield occurred, which appears to have been a real effect not due to some peculiarity of the sample.

An explanation for this pattern of response is not easy to find. At first sight it seems to have been due to the presence of clover in the sward, which can be suppressed by shading the grasses when high rates of nitrogen are applied. If this explanation is correct, one can conclude that in 1960 and 1961 farmers were able to apply, on average, up to some 80 units of nitrogen per acre while still getting an effective contribution from the clover.

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* Reported in *Agriculture*, September, 1960.

The timing and number of fertilizer applications made during the season must be considered as well as the total amount of nitrogen applied. The general practice on the recorded farms has been to apply a compound fertilizer in spring, sometimes followed up by one or more applications of straight nitrogen. The 80-unit rate, which seems, on average, to have been the most productive in 1960 and 1961, was generally made up of a compound, plus one dressing of nitrogen. The higher, apparently less productive rate included a second nitrogen dressing, making three applications of fertilizer in all. Information on the timing of applications will be available after the 1962 recording season, when farmers have been asked to state the month in which each application is made. It is hoped then to be able to uncover some of the causes of the less-rewarding yields so frequently obtained in the survey at certain nitrogen levels.

Phosphate and potash

It is possible by statistical methods to separate the general effects of the three plant foods from one another, but at any given level of one plant food, one cannot be certain of the extent to which the other plant foods are contributing to the yield. Taking the recorded farms as a whole, however, it seems that phosphate and potash application rates are much the same at each nitrogen rate, and this merely reflects the practice described above of applying one compound dressing only, followed up by straight nitrogen.

On the other hand, it has become recognized in recent years that the effect of nitrogen is influenced by the phosphate and potash available, and that at high nitrogen rates more phosphate and potash is generally needed. The records for 1961 have been analysed to see whether any such effects can be found, and the results for nitrogen and phosphate are set out below. In this table the yield is given in terms of U.S.E. at various nitrogen and phosphate levels. Yields at nitrogen rates above the 80–100 level are complicated by the depression already described, and at higher rates still the sample is too small to give worthwhile results.

Effect of nitrogen and phosphate on the yield from leys

(cwt U.S.E. per acre)

		Units P_2O_5 per acre	
		0-40	60 +
Units N per acre	0— 20	18	19
	20— 40	20	20
	40— 60	20	23
	60— 80	24	26
	80—100	22	29

The results suggest that where a low nitrogen rate was applied the lower phosphate rate was adequate, but at higher rates of nitrogen heavier phosphate applications were needed for the best yields. The difference in yield between low and high nitrogen on the low phosphate fields was some 5 cwt per acre, but on the higher phosphate fields this difference increased to 10 cwt U.S.E. per acre.

This interaction effect between nitrogen and phosphate is so marked that a closer look has been taken at the individual fields where these very high yields have been obtained. They seem to be in no way abnormal and the result merely adds weight to the view, generally accepted by dairy farmers, that

nitrogen should be used in conjunction with phosphate if really good results are to be obtained.

Potash is rarely applied as a straight fertilizer, and its effect is, therefore, much more difficult to separate from that of nitrogen. By using the same technique as for phosphate, it has only been possible to conclude that at higher potash rates rather better yields have been obtained. Very few of the fields received less than 40 or more than 60 units per acre. A larger sample of fields is needed before reliable conclusions can be drawn.

Importance of management

The farms included in this recording scheme are much more productive than the average. In terms of U.S.E., yields from grassland have been raised to some 50 per cent above the national average—clearly skilful grassland management. 'Management' is a term which is difficult to define; it includes many facets of day-to-day farming which contribute to success. The most important contributions that grassland recording can make are in highlighting deficiencies in management and helping towards a better understanding of the grassland problems of the commercial farm.

Mr. J. A. Bancroft-Wilson, M.A.(Cantab.), is at present Agricultural Liaison Manager to Fisons Fertilizers Limited. He was a member of Cambridge University Farm Economics Branch until 1949, and then served in the National Agricultural Advisory Service, in Somerset, until 1955.

Wheat Bulb Fly Warning

THERE is a considerable risk of damage to winter wheat from wheat bulb fly in the coming season in some parts of the country. This forecast is based on the results of the Ministry's routine soil sampling. The areas likely to be worst affected are the Eastern and East Midland counties, especially the Isle of Ely, and parts of the East Riding, although districts within these areas not normally troubled by wheat bulb fly should not be unduly affected.

The risk of damage is greatest in the areas mentioned above on heavy land after fallow, on peat soils, and on land following potatoes; but the pattern of egg laying, even in the areas likely to be worst affected, has been very variable. It is, therefore, extremely important that local advice about the use of seed dressings, or other control measures, should be obtained from the N.A.A.S. District Advisory Officers.

The Ministry wishes to remind all concerned that it has been agreed that seed dressed with aldrin, dieldrin and heptachlor should be sown this autumn only in places where there is a real risk of wheat bulb fly attack and should not be sown at all after 31st December. There is, however, no restriction on the use of *gamma*-BHC dressings which, in any case, are probably the most effective on crops sown from December onwards. Farmers who do use the restricted dressings should take care to sow all dressed seed before the end of the year and not carry any over to the spring.

An account of the life history and control of this pest is given in the Ministry's Advisory Leaflet No. 177 *Wheat Bulb Fly*.

The first of two articles by **John Young**

Beef Recording for Profit

FOR several years I have kept a cattle breeding diary, recording every thought I believed worth committing to paper. It interests me to read what I was thinking five years ago, of the plans I laid, of my beliefs in the transmission of various characters, how I hoped to build cumulatively the characters I wanted into successive generations.

Some of my plans have been modified but one has remained unaltered throughout, and indeed it gets more interesting the longer it is applied. This is the recording of weights at standard ages, so building a more complete picture of every breeding female through the performance of her progeny. In the process, the effect of any particular sire used in the herd can be measured. This data, very simply collected, provides a permanent record of what happens as a result of any mating system employed.

I record other things besides weight. They include coat colour, conformation grade and whether the progeny is polled, horned or scurred. A more or less complete description of every animal is gradually compiled by observation

Polled bulls, 9–11 months old, all reared together

through its various stages of development. Whether I succeed or not in achieving what I set out to breed will for some time be in the melting pot. Whether success or failure results, at least there will be a sound record of all the steps I have taken which might profit my successor!

Search for a system

I have been breeding beef cattle for eighteen years. The first twelve were spent in breeding a polled cross-bred herd of commercial Herefords. They were non-pedigree and never would have been eligible for any herd book. When I found it was possible to import direct from the U.S.A. a pedigree polled Hereford bull and so concentrate on stock of far greater potential value, I made a quick decision. With the exception of five pedigree horned Hereford females, every animal on the farm was sold. I began again at the bottom!

Looking back, I think the complete dispersion of several years' work without any record of what had happened except the sale returns, consciously prompted me to think over the desirability of having some permanent record, step by step, of what happens in a breeding herd; to see if some pattern of results could be seen, some hard-and-fast conclusions drawn from which one could cumulatively build with confidence.

A voracious reader, I scanned every publication on heredity—indeed anything pertaining to the breeding and history of any forms of livestock, both here and abroad, that might provide a foundation upon which to build. I had also made good use of one or two well-known geneticists who were keen to help. I wanted a more permanent and detailed record of breeding results, something that would be of value in successive generations. After three attempts I formulated a permanent record sheet, and devised a simple weight-recording plan for stock at standard ages.

Any new breeder, whichever breed he takes up, knows very well there is a hard crust to break before he gets any recognition. It is a long climb to the top. He must embrace anything that will help his ascent. There is a lot of accumulated knowledge in any breed, but it is slow to come to the notice of the newcomer! Much of it is handed down from father to son and tends to be coveted by those who possess it as a trade secret. Some of it is contradictory. Mystic and mistaken beliefs abound and there are few corner-stones upon which the novice can confidently build. This is not to deny that there are at the same time some very astute and knowledgeable breeders.

Commercial target

It is the task of everyone who aspires to build a top-class herd to take stock of the position himself, to know what his target is, and seek to evolve a strain of cattle that answers the demands of the day and can be moulded to suit the demands of tomorrow. In the process every facet of breeding and environment must come under review. My target was, and remains, to breed bulls of sound construction, increasing rate of gain, strong bone and great fleshing that will with one cross bring about a marked improvement in cross-bred dairy calves for commercial feeding. This I believe to be the main justification for breeding pedigree beef sires in this country; most of our land is too expensive to run pure beef breeding herds. There is a big potential trade for the right bulls for mating to dairy-bred animals on whom we must perforce rely for most of our beef.

Cows and calves are kept outside all the year round. The calves have a shelter and creep feed. The dams have a strawyard but no shelter

This, of course, does not preclude selling some of the best bulls for pedigree breeding at a higher figure than the commercial men can afford to pay. Indeed, the basis of all pedigree beef breeding is, or should be, the fixing in combination of characters of commercial merit bred in depth so that such characters breed on. There is a mistaken view that most pedigree breeders aim at breeding show winners, as though winning awards were an end in itself! Very high prices for occasional bulls which represent only a fraction of those in any breed come as a result of concentrated breeding over several generations to set all the most sought after commercial characters. Most of these have a low percentage transmission and, in giving high prices for such animals, the purchaser is buying time, saving himself, or so he hopes, several generations of culling. In a sound constructive breeding programme, particularly in a sizeable herd, I believe recording to be invaluable.

Required characteristics

But records alone cannot guide a breeder to success. He must be able to recognize merit when he sees it. He must possess the threads of mating systems that are sound and which cumulatively concentrate characters, yet at the same time escape the penalty that befalls most who practise forms of close breeding, i.e., inbreeding recession. Weight or any other records alone will achieve nothing if these ingredients are missing. Their use to the constructive breeder lies in the fact that they are guide posts for new generations as they come along. The plant breeder carefully measures all relevant characters in breeding a new variety of grain. He seeks to implant in fixed combination factors that will raise a new variety above those already on the market. He must pay attention to strength of straw, resistance to disease, tightness or looseness of chaff, hardiness, quality and yield of grain, to mention only a few.

Similarly, I believe the aspiring pedigree breeder should record the factors he is seeking to breed into his cattle. There are so many loose assessments to be made that where it is possible firmly to record any character it will be to his profit to do so. Weight is only one, but it is a very important one. Within limits, that is what the commercial feeder is paid on over the scales, whether the animal is alive or dead.

Gaps in our knowledge

The gaps in our knowledge, even in respect of weight inheritance only, are prodigious. There are no figures available to show the average birth weight in any breed of bull and heifer calves. Hence there is no precise knowledge of relationship between that and weaning weight or between either with weight at maturity. The degree to which weight is transmitted by sire or dam to progeny is guesswork arising from observation and experience. It is generally believed that the sire is the main transmitter of increased size, that the dam has a marked influence until twelve to fourteen months of age; the influence of the sire becomes apparent afterwards. Experience gained from recording may possibly show that the chief influence of a sire in this direction is first through his daughters, to be followed by increasing weight in his grandsons.

There is no actual record in any herd of any sire having raised or lowered the maturity weights of his 'get' though there are numerous instances when this has happened, and of course it is going on all the time.

Neither is there any record showing that big, strong and weighty females rarely reproduce their type; that the lighter and more feminine individuals of medium size are generally superior breeders. This is generally accepted as a fact, but there is nothing to guide us statistically. At the same time there are instances of wonderfully good cows of great size proving great breeders. There is a record of a famous cow in the U.S.A. which proved a great breeder, won numerous awards and in good condition weighed a ton! (2,000 lb is the American ton.)

There is no reliable guide in cattle breeding to the degree to which certain mating systems result in inbreeding recession. (No line or inbreeding work has to my knowledge ever been undertaken experimentally which falls in line with actual mating systems followed by the most successful breeders!) All breeding with higher animals is a halving process. Half the characters come from the sire element and half through the dam, and they tend to disperse rather than build a concentration of desirable characters. Yet there are instances of cattle breeding within closed herds being a cumulative process in the right hands without loss of vigour or performance in succeeding generations. An actual measurement of weight at standard ages recorded through various line and inbreeding practices would reveal valuable information.

Outcrossing is generally associated with addition, retention, or recovery of vigour and performance, the very opposite in effect to close breeding. Of this there is no absolute certainty under certain conditions. If a sound cumulative line breeding system is being followed, outcrossing recession is, I believe, a phenomenon which can come into play where an outcross sire is used.

These and other considerations indicate the extent to which any new, even established breeder, is working in the dark. They are enough to justify collection of weights as breeding systems develop.

The second article will appear in next month's issue

John Young, N.D.A., N.D.D., farms 600 acres in West Norfolk. He has a breeding herd of 100 females developing pedigree Poll Herefords from a foundation of horned females and imported bulls. The herd has been recorded since 1957.

Ley farming on the Yorkshire Wolds for fat lamb and beef production, as seen on Mr. C. C. Wallis's farm, is described by

WOLD FARM

F. J. THOMAS
and
W. A. WALSH

MUCH of the farming on the Yorkshire Wolds is traditional. Large areas are still farmed on the five-course rotation of seeds, winter wheat, spring barley, roots, barley undersown. The roots are folded off in winter by sheep, either with the ewe flock or hoggs which are overwintered and sold fat between February and May. The seeds consist of red and white clover which, in a good season, provide excellent easily-managed keep for the ewes and lambs, but in a late spring and dry summer the amount of keep produced is small. The five-course rotation has one great advantage in that it puts 60 per cent of the farm in corn and, as this is the main cash crop of the Wolds, any change to ley farming must take this fact into account.

Ley farming is, however, being practised on a number of farms. A good example is Allison Wold Farm, Sherburn, near Malton, in the occupation of Mr. C. C. Wallis.

This is a typical Wold farm of 380 acres on the chalk lying on the escarpment overlooking the vale of Pickering. The rotation in the past has been three years ley, followed by winter wheat and two barley crops. Now, owing to the increased production being obtained from the leys, the rotation is being changed to a flexible one of two to three year leys followed by three to four years of corn.

Cropping on a flexible system

In general, fields most suitable for stock will be kept down to grass for three years, and the fields furthest from the farm will grow more corn. This year is the first on this flexible system and the cropping is 40 acres winter wheat, 185 acres spring barley, 155 acres ley and permanent pasture. The winter wheat is either Cappelle Desprez or Professor Marchal, and is combine drilled with 2 cwt per acre of 6:15:15 fertilizer and normally receives 60 units of nitrogen as a top dressing in the spring.

The barley variety most favoured is Ingrid (because of its earliness) but some Proctor is grown. All the barley is combine drilled with 4 cwt per acre of 16:9:9 fertilizer and, if any of the crop is backward, extra nitrogen is applied as a top dressing. The average yield of barley over recent years has

been approximately 30 cwt per acre, while the winter wheat has been around the 40 cwt per acre mark. The seeds mixture used on the farm is:

	lb per acre
S.143 cocksfoot	8
S.23 perennial ryegrass	6
Hunsballe perennial ryegrass	6
New Zealand mother seed white clover	3
	23

The fertilizer dressing is uniform on the grass fields whether or not they are for grazing or conservation. All fields get a dressing of 4 cwt of 16:9:9 per acre in the early spring. As a general rule no extra nitrogen is given to the grass, unless shortage of keep makes it necessary. A top dressing of 2 cwt per acre of compound fertilizer is applied after each cut of silage, in order to replace the phosphate and potash removed by this operation.

The main method of grass conservation on the farm is silage, made in an open pit, using a forage harvester. A small amount of hay is made later in the season if surplus grass is available. Part of the barley acreage is undersown with Italian ryegrass for use by the sheep during the winter and early spring.

Advantage to sheep

As regards livestock on the Wolds, one of the difficulties of the five-course rotation is that it is possible to feed many more sheep in the winter than can be kept during the summer, and it is therefore not possible to get high stocking rates with ewes and lambs during the summer months. The practice of growing clover seeds without the use of grasses accentuates this difficulty.

Switching from the five-course rotation to a rotation using leys, it becomes possible to increase the number of ewes on the farm, and the production from the grass part of the rotation is thereby substantially increased. The grasses will also allow for an increased stocking of cattle in the summer time. This is an advantage, since the presence of cattle enables pasture to be better managed for the ewes and lambs.

Management

On this farm the increase in livestock output has come mainly from the sheep. At present there are 217 breeding ewes, mainly Mashams, and the lamb crop this year was 388. The ewe flock is managed intensively on a set stocking system, but Mr. Wallis has found no advantage from forward creep grazing. Lambing starts during the last week in March and the ewes and lambs are set stocked on a new ley; between 6 and 7 ewes to the acre, together with their lambs. The majority of the lambs are marketed fat by the end of July, the marketing weight being between 90 and 100 lb live weight.

At weaning, the remainder of the lambs are put on to grass which has previously been mown for silage and are sold off as they become fat. The aim is to market the whole of the lamb crop by the end of October. It is sometimes necessary to use a little hand-feed for the later lambs, but this is exceptional.

Whilst it is possible to get a high stocking rate during the summer months, the aim in winter is to allow the ewes to work over most of the farm and so avoid having them in the late winter on land needed either for early grazing or conservation. The policy with the ewes after weaning is to turn them on to a bare pasture before flushing, then, after going to the ram, on to a stubble

which has been undersown with ryegrass. They spend the autumn months grazing the leys and on other undersown stubbles. They end up in January on an undersown stubble and are fed silage as their main supplementary feed.

As the sheep clear the stubble it is ploughed immediately behind them; by lambing time they are on a very small area. This system enables the sheep to be kept completely off the leys during the critical months of January to March. A concentrate mixture is also fed during the last few weeks before lambing.

Bought-in calves

The cattle stocking is determined by the accommodation available for wintering, and whilst maximum use has been made of suitable buildings, it is not Mr. Wallis's intention to erect more buildings for cattle. Any increase of livestock which may be possible will be brought about by increasing the number of calves reared or by an increase in the number of breeding ewes. If the former alternative is carried out it will mean marketing the cattle at younger ages and lighter weights in order not to increase the number of buildings required.

The system which suits him best is to rear calves in the early autumn months. The number reared each year is around 60. These are bought in two batches of 30, the first at the end of July and the second in early October. They are reared on the bucket on the early weaning system and, from the age of 8 weeks to turning out the following spring, receive a home-mixed ration at about 5 lb per head, together with free access to silage and a little hay.

When they are turned out in the spring they are stocked at the rate of about 4 to the acre on good grass, but at times mixed grazing is carried out along with the sheep, particularly when the grass looks likely to be getting in front of the latter.

Early marketing

Cattle are brought in at the end of September and are wintered on a ration of 45 lb silage, 4–5 lb hay and a concentrate mix of cereals which is increased up to 8 lb as quickly as possible, with the idea of getting all the animals marketed by April of the following year. The average weight of bullocks produced under this system has been 9 cwt and the cattle are marketed as they become fit, the age varying from 16–20 months. Because of the need for giving the ewes priority, Mr. Wallis tries to avoid having to turn his cattle out for the second summer. The system works provided yearling cattle are housed in good time and are pushed during the following winter. It will not work where any store period is allowed to intervene.

A few pigs

Pigs are a minor enterprise, as on most Wold farms. The unit is limited to the accommodation of the original buildings. The policy is to keep approximately 20 Landrace × Essex sows and put them to a Landrace boar. Disposal of the progeny is generally as pork, but no attempt is made to have a regular through-put of pork pigs, and at times some of the progeny are sold as weaners. The decision to do so is affected mainly by accommodation, feed prices and the price of store pigs. It is not considered worth while on the farm to build up a pig fattening enterprise, since this would involve

further capital expenditure on buildings and create labour difficulties. As it is run at the moment, it can easily be dealt with as a spare-time occupation.

Simplification

The main objective on Allison Wold farm is simplification. The number of enterprises have been reduced to cereal growing, beef and sheep production from the grass and the small pig enterprise. This means that management problems are eased and efforts can be concentrated on making each enterprise work as efficiently as possible. It is imperative under this system, however, that the grass be managed well so that it gives good production, both as a grazing sward and as a conserved product.

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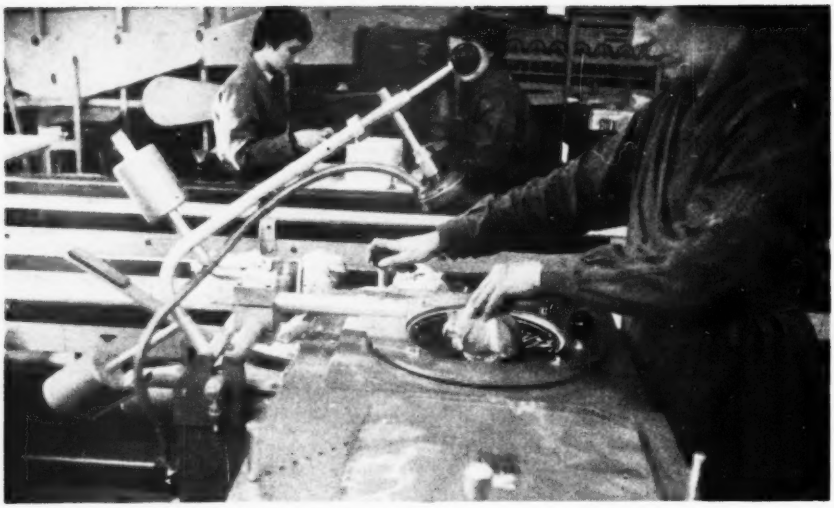
From Farm to Supermarket (2)

G. H. Stansfield

continues his article from last month

PREPACKING is accomplished at all levels from farm to retail shop. Generally, the more perishable products are prepacked at retail stage or near to it, and the hard commodities are prepacked on the farm. But distances are short in this country, and it is possible to prepack even the most perishable fruits and vegetables at farm level if adequate protection is given and the most suitable types of film are used according to the crop.

There are four main points at which prepacking is carried out. These are all within the normal distribution chain from farm to retail outlet. They are at individual farms or nurseries, specialist packhouses (often owned by country merchants) in the production areas, specialist packhouses (often owned by wholesalers) in or near the consumption areas, and at the retail stores.



Semi-automatic overwrapping of cauliflowers

The pattern which emerged early in the history of prepacking has been maintained, whereby most of the prepacking in this country is still done in or near the main areas of production by individual farmers or country merchants. Most of these are specialist packers of crops which they themselves grow or in which they deal. Many of them are already in a big way of business and often have growing as well as distributive interests. A lot of these packhouses work on a seasonal basis when home-grown crops are available. Others, however, have been keeping the packhouses working all the year by dealing also with imported produce.

Because of the multiple interests of many of the prepackers, it is difficult to tabulate them according to business activities. Many, with the need to secure year-round supplies and year-round work for their packhouses, have found themselves involved in buying activities, both for home-grown and imported produce. At one time this would not have been thought desirable or a necessary part of their business.

The specialist packers near the consuming areas have tended to concentrate on the supply of a *variety* of prepacked produce. A wide range of fruits and vegetables is packed and often executed against firm orders. Many of this class of packer have wholesaling interests and consequently are in a good position to prepack imported produce in addition to home-grown.

Generally, the retailers prepack only those items which they cannot get from the specialist packhouse. For packing at store level, produce has to be bought in the usual bulk market packs and re-packed.

In many shops preparation space is very limited, and this, together with the problem of disposing of waste material and low-grade produce, discourages extensive store-level packing. Nevertheless, many stores do much of their own prepacking. Some prepack as much as possible at retail level; others buy in as many products as they can already prepacked. One of the biggest controlling interests in supermarkets in this country has recently reversed its policy of packing at store level. This has led to increased business for already established specialist packhouses.

Convenience foods

The modern housewife, with less and less time available or inclination to spend time in the preparation of meals, is constantly on the look-out for pre-prepared foods; hence the popularity of 'instant' foods. The prepacking of fresh fruits and vegetables allows some form of preparation of the produce to be carried out prior to the retail stage; also certain types of produce can be grouped to form a composite pack of related items in consumer-sized units—a boon to busy housewives.

Almost all vegetables are cleaned before packing, and some packers produce trimmed Brussels sprouts and shelled peas in pot-ready form.

The use of anti-oxidants to prevent browning of cut surfaces is not at present permitted except in the case of pre-peeled potatoes, and this limits to some extent the preparation of packs of prepared produce.

Mixed tossed salad and mixed soup packs which are produced in large quantities in the U.S.A. and on the Continent, are not popular in this country.

Kinds of prepacked produce

Individual firms have their own policies and idiosyncrasies as to what should and should not be prepacked.

Anomalies can be seen in the same store; for example, prepacked melons sold alongside loose, imported onions. Melons need no prepacking and onions would be better packed to prevent tainting other purchases in the shopping basket.

About 25 per cent of all retail sales of potatoes are now in prepacked form. The 5-lb pack has become the most popular size, both from the packers' and consumers' points of view, particularly since it is easy to carry and a thinner guage of film and a minimum overweight are required for such a size of pack. Smaller packs of 3 lb are in demand in some areas and new potatoes often start the season in 1-lb units, gradually increasing in weight as the season advances. A development of the last two seasons has been the sale of 56-lb packs of washed and graded potatoes.

Basically there are two ways of preparing potatoes—washing and dry-brushing. In the south of England it is now difficult to sell dry-brushed potatoes, but in the north-east only dry-brushed are wanted. The region in which potatoes are grown and the climate at lifting time determines whether potatoes should be washed or dry-cleaned. Potatoes grown on heavy clay soil need to be washed to make them presentable, but the same degree of cleaning is not necessary for siltland crops.

Mechanical damage at harvesting, secondary growth and splits and cracks caused by wet weather in late summer, and damage due to disease are the worst problems which beset the potato prepacker. Such damage is difficult to see until the tubers are washed, and many prepackers have excessive wastage figures (up to 40 per cent, average 15–20 per cent) on consignments of potatoes bought at a firm price.

Among the root crops, carrots are the most popular for prepacking. Carrots were already being sold washed and graded before they were pre-packed but, by virtue of their shape, they lend themselves to prepacking. At one time more carrots were being prepacked than they are today and, like potatoes, were being sold in a multitude of different types of outlet. However,

Mushroom prepacking line

the trade has now settled down to sales in supermarkets only and the 1-lb unit is universal.

Apart from the composite salad packs, lettuces are also prepacked in perforated polythene bags with open tops, transported in single-layer trays. Spring onions are also a 'natural' for sleeve wrapping after the normal bunching.

Tomatoes, like most fruits, require the protection given by the carton or tray pack if they have to travel to the retail shop. They are often packed in 6's or 8's, to give a pack of approximately 1 lb in a wrapped carton. The prepacking of celery has taken a step forward during the past season. Many of the celery growers of the Fens are now prepacking a proportion of their crop. The washed celery is trimmed and packed in special sizes of polyethylene bags which are left open for transport.

Cauliflower prepacking has not expanded at the rate it might have done. Severely trimmed heads of cauliflower when prepacked weigh half the weight of a curd plus leaves left on to protect the cauliflower on the way to market; yet the freshness can be retained by the plastic film.

Brussels sprouts are sometimes bag-packed and often they are trimmed before packing. Last season some packers marketed prepacked sprouts 'on the stem' with roots and tops removed to allow the housewife to pick her own sprouts as required.

Leeks were one of the first crops to be prepacked in this country by a grower packing in a glut year. After 10 years his packs are still asked for by many outlets. Assembled in units of three, they are overwrapped and make a most attractive pack.

The principal problem when packing fruit is to isolate the individual fruits, give protection and hold the fruit firmly to prevent bruising from abrasion and vibration.

Many of the apple packhouses of Kent, Essex and Worcestershire have been carrying out some prepackaging as a side-line in recent years. However, last season's short crop abruptly halted this sort of activity. Even those firms

who in recent years have prepacked the majority of their crop, have this year found that bulk packing brought them the best and easiest return.

During last winter, therefore, apple prepacking was confined to the specialist packhouses, packing against firm orders from the supermarkets.

In the past, pears and plums have not been prepacked to any great extent at farm level; mostly they have been repacked from bulk at store level. However, the field is quite open and a really good prepack of plums with the variety stated could do a great deal to popularize this fruit.

The changing pattern of distribution

It is not only in the High Street supermarket that new methods of sale are to be seen; the normal chain of distribution of grower-wholesaler-retailer has in many cases been broken by direct selling from farm to supermarket.

Bulk buying of fresh fruits and vegetables for a chain of supermarkets confers greater bargaining power and better service. While big buyers are still to be seen in the wholesale markets, the tendency is for the buyer to stay in his office and order supplies on sample, graded according to his own specifications, and brought to him by the vendor. Inevitably such bulk purchasing has led to direct consignment from grower or packer to the supermarket warehouse and the by-passing of the wholesale market. Some packers are also willing to arrange for a delivery-round to the individual supermarkets of a chain organization, but the cost of such an operation can nullify the economic advantage of direct selling.

The wholesalers themselves are to some extent to blame for the increase in direct selling, for they were exceedingly sceptical of prepacking in the earlier years. They just did not want to know anything about this new method of packing and many of them said it could not last. The direct result has been that prepacked produce has not appeared on the wholesale markets to any great extent, except for the use of the markets as a convenient transfer point from packer to retailer for pre-ordered consignments. It is only in the last few years that the wholesalers have begun to see any future in prepacking and now many of them have an interest, controlling or participant, in some of the specialist prepack plants.

Grain can spell Danger

THREE people have died within two months as a result of being smothered in grain pits or bins. When grain is being drawn off from the bottom of a pit or silo the top of the heap is most unstable and won't bear anyone's weight. Once the feet and legs have been sucked into the vortex, it is almost impossible for rescue operations to succeed—even if someone happens to be present to make the attempt.

T. E. GIBSON, *of the Ministry's Central Veterinary Laboratory, points to some of the recent advances made with drugs for*

Worming Cattle and Sheep

DURING the last fifty years many research workers have been trying to improve the treatment of worm-infested animals. Copper sulphate, carbon tetrachloride, tetrachlorethylene and some other compounds were introduced as veterinary anthelmintics and, whilst some progress was made, there was a lot of room for improvement. More recently new methods of chemotherapeutic screening have been used in an endeavour to discover new anthelmintics, and spectacular progress has been made in many directions. The value of some of these new products is reviewed in this article.

Stomach and intestinal worms

Phenothiazine, introduced some twenty years ago, has been widely and successfully used for the removal of stomach and intestinal worms of sheep and cattle. Although a great improvement on remedies formerly used, phenothiazine was found to have a number of disadvantages—the dose has to be large, spilled drench causes red staining of the fleece, and in cattle untoward effects sometimes follow treatment.

Recent research has shown that both the purity and the fineness of the powder influence the efficacy of phenothiazine. If purity is lower then 85 per cent, efficiency falls considerably, but in this country the purity of the phenothiazine sold commercially has always been higher than that. The greater efficiency of finely-ground material, especially against intestinal worms, has induced manufacturers to place finely-ground preparations on the market for the treatment of sheep. The use of these preparations is not generally advised for cattle, since the greater amount of the finely-ground material which is absorbed into the blood stream may result in undesirable toxic effects. The mixture of small amounts of certain organo-phosphorus compounds with phenothiazine increases efficiency, especially against worms living in the small intestine of sheep. One of these, a coroxon-phenothiazine mixture, has been placed on the market and when used at the recommended dose rates is quite safe. But care should be taken not to exceed the recommended dose, and lambs under six weeks of age or under 25 lb weight should not be treated.

Organo-phosphorus compounds

Many of the organic phosphorus compounds, originally investigated for military purposes, have been tested as insecticides, and some half dozen or so have been tested as anthelmintics for cattle and sheep. None of the compounds investigated up to the present time has shown sufficient promise to rival phenothiazine for sheep. The compound trichlorphon has, however, been found to be effective for the removal of the worm *Ostertagia* spp. from cattle, and it has been widely used in Australia. Although the drug causes untoward symptoms—panting, salivation, restlessness and diarrhoea—it is claimed that these effects pass off without treatment. In Britain our experience has not been so happy, fatalities having followed treatment. This drug should be used only under veterinary supervision, so that an antidote may be given to any animals which show signs of poisoning.

Methyridine

In 1961 British research workers discovered the anthelmintic properties of methyridine (now sold under proprietary names). This substance is unusual in being active as an anthelmintic, whether given by subcutaneous injection or by mouth. If given by injection it passes into the stomach and intestine, where it exerts its anthelmintic effect. It is especially active in removing worms which inhabit the small intestine, but it exerts serviceable activity against worms in the stomach, although action against the latter is rather variable. It is claimed that the drug removes immature worms.

The recommended dose is quite safe, but twice the dose causes staggering in some animals, and three times the dose has proved fatal. Small swellings often occur at the site of injection, particularly in cattle, but these usually disappear uneventfully. Methyridine is probably the best anthelmintic at present available for use in cattle.

Thiabendazole

Towards the end of 1961 American research workers reported the discovery of a new compound, thiabendazole, which was claimed to have anthelmintic activity in a variety of farm animals. It has been most widely tested in sheep and has been shown to be extremely efficient in removing a wide range of both mature and immature worms. The dose is small and the drug causes no staining of the fleece. Very large doses have to be given to cause untoward effects, and such doses are unlikely to be accidentally administered in practice.

It seems likely that this drug will prove popular for the removal of stomach and intestinal worms from sheep. It has been on sale for about a year in Australia and has recently been put on the market in this country for the treatment of sheep. Perhaps a higher dose rate will be required in cattle, but so far insufficient tests have been carried out for its value in cattle to be assessed.

Bephenium compounds

During the last ten years nematodirus disease has been recognized as a serious problem in young lambs—an intractable problem before the discovery of the bephenium compounds. These substances are very efficient in the removal of *nematodirus* worms from lambs, and they are highly efficient in removing the immature worms—the major cause of loss from that disease.

Two bephenium compounds have been widely used in the treatment of nematodiriasis. The one now sold commercially for that purpose has been chosen because its action is useful against certain other stomach and intestinal worms as well.

Liver fluke

Carbon tetrachloride has been used successfully since 1926 for the treatment of liver fluke disease in sheep, and all sheep farmers are familiar with it. Although German workers studied its use by subcutaneous injection as long ago as 1927, it has not so been used in this country until modern work in Europe renewed interest in it. In recent trials the drug has been given intramuscularly as well as subcutaneously, incorporated in a variety of vehicles, but principally liquid paraffin. Although efficient when given by injection, there is no doubt that the injection causes pain and that damage to the muscle occurs when the mixture is given intramuscularly. The damaged muscle usually heals within a short time, leaving a nodule of fibrous tissue within the muscle. The pain caused by the injection can be reduced by incorporating a small quantity of a suitable local anaesthetic with the injection.

In Britain the carbon tetrachloride is not usually mixed with liquid paraffin but is dispensed along with equal parts of a petrolatum compound. There is no evidence that the drug is less toxic when given by injection and it is a matter of personal choice whether the drug is easier to administer by mouth or by injection.

Hexachlorophene

Several new compounds have been tested in an endeavour to find a drug superior to carbon tetrachloride for the removal of liver flukes. Of those tested, only hexachlorophene has been used in this country. Although the drug can be given by injection, it is usually administered by mouth. It is safe to use in both cattle and sheep, and the milk yield is not depressed in milking cattle. Untoward effects have not been reported following its use in the field, but the drug has not yet been used sufficiently widely to be certain that idiosyncrasy will not arise. There is some evidence that doses higher than are normally used will remove immature flukes. If these higher doses prove safe in practice, the drug will find wide application in the treatment of acute liver fluke disease.

Lungworms

Giving drugs by injection into the windpipe or by inhalation has been standard practice for many years. It was not until 1957 that drugs acting specifically on lungworms were discovered. The first of these, called cyanacethydrazide, is given either by mouth or by subcutaneous injection. The drug is excreted into the lungs, where it paralyses the lungworms which are then swept out of the lungs by the action of the cells lining the air passages. The drug acts only on adult lungworms, leaving the immature worms unharmed. In practice, therefore, many cases of husk do not respond to cyanacethydrazide, since a sufficient number of immature worms are left behind to cause considerable harm.

The second drug recently introduced for the control of lungworms is diethylcarbamazine. This is extremely efficient in the removal of immature worms and consequently is most beneficial in the early stages of the disease.

In many outbreaks of husk satisfactory results are obtained, but in long-standing cases results are unsatisfactory.

In the last few years spectacular advances have been made in the treatment of parasitic diseases of farm animals. The greatest progress has been made in the treatment of parasites of the stomach and intestines, but advances have also been made in the treatment of liver fluke disease and husk. It is in these latter two conditions that further research is most urgently needed. Research work is continuing in many laboratories all over the world and the next few years are likely to see even greater progress than has already been made.

The proprietary brands under which the chemicals referred to in this article are marketed can be ascertained from your local veterinary surgeon or supplier.

The Ministry's Publications

Since the list published in the October, 1962, issue of *Agriculture* (p. 339) the following publications have been issued.

MAJOR PUBLICATIONS

Copies are obtainable from Government Bookshops (addresses on p. 404), from Divisional Offices of the Ministry or through any bookseller at the price quoted.

BULLETINS

No. 160. Housing the Pig (Revised) 5*s.* 6*d.* (by post 6*s.*)
Covers all aspects of the subject, including climatic requirements, functional and structural design, planning and layout. Well illustrated.

LEAFLETS

Up to six single copies of Advisory Leaflets may be obtained free on application to the Ministry (Publications), Ruskin Avenue, Kew, Richmond, Surrey. Copies beyond this limit must be purchased from Government Bookshops, price 3d. each (by post 6d.).

ADVISORY LEAFLETS

No. 18. Cabbage Root Fly (Revised)

No. 69. Cabbage Caterpillars (Revised)

No. 89. Couch and Twitch (Revised)

No. 93. Bovine Contagious Abortion (Revised)

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FIXED EQUIPMENT OF THE FARM LEAFLET

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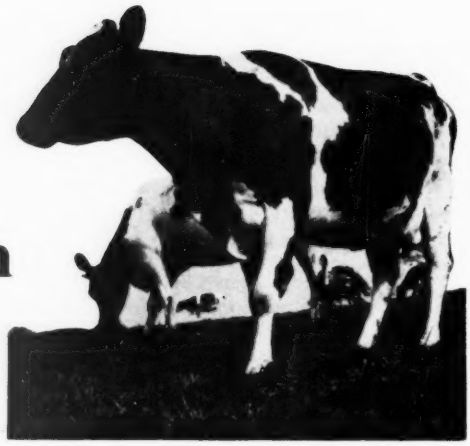
Pennine Dairy Farm



GLYN WILLIAMS

Well-managed grass, and therefore less bought concentrates, is bringing Mr. Barraclough a margin over all food costs of 1s. 7d. a gallon

INTENSIVE milk production is the traditional system of farming in the industrial Pennines of West Yorkshire and East Lancashire. This was developed at the beginning of the last century to meet the needs of the liquid market created by the growing urban population. Because of poor soil and a difficult climate, the system of milk production was originally based upon the use of large quantities of bought concentrates, and when these were cheap the farmers were able to make a reasonable living. But in recent years they have had a very difficult time. It is now clear that if they are to remain in milk production (and they have little alternative) the farming system must be changed to one based upon intensive grass production.

Four-point policy

One of the pioneers of intensive grass production in the area is Mr. Oliver Barraclough, of Well Heads Farm, Thornton, just outside Bradford. Mr. Barraclough farms 85 acres at 1,000 ft above sea level. The rainfall is between 45 and 50 inches a year. The policy of intensive grass production which he began in 1947 has been so developed that cow numbers have now been built up to an average of 64 and milk output over 52,000 gallons. Well over half of the milk comes from the farm itself. The farm is managed comfortably by Mr. Barraclough, his son and one man, notwithstanding that there are also fairly substantial pig and poultry enterprises.

Apart from 5–6 acres of kale (sown in late June after grass) all the farm is in grass—all leys, except for 3 acres of permanent pasture. The grassland policy is governed by four principles: (1) the use of leys to get maximum output; (2) a high level of fertilizer usage; (3) controlled grazing by means of an electric fence; and (4) a conservation policy based entirely on silage.

Good grass

Approximately 30 acres of lighter soil on the farm are sown to short-term leys of ryegrass, which remain down for two or three years. At one time the short-term leys consisted solely of Italian ryegrass, but because of the severe winter kill that regularly occurs at this high altitude, a mixture of 15 lb Italian ryegrass and 20 lb perennial ryegrass is now sown. The remainder of the farm, where the soil is heavier, is sown to long-term leys based on perennial ryegrass or timothy/meadow fescue/ryegrass and lasts for 6—8 years. These leys are primarily for cutting, and are usually cut twice a year. The ryegrass leys are primarily grazing, but all are cut once a year. All leys are sown direct, a total of between 20 and 25 acres each year, about one-third of which is long-term ley.

The whole farm is managed intensively and the basic policy is that every acre receives an application of 4 cwt C.C.F. (12:12:18) each year, followed by three or four dressings of 3 cwt Nitro-Chalk. On those fields cut twice for silage, one of the later applications of Nitro-Chalk is replaced by KayNitro (16:0:16).

An important part of the policy is the application of over 100 units of nitrogen to all established grass before the end of April. The C.C.F. application is given in late March, followed in mid-April by 3 cwt Nitro-Chalk per acre. Subsequent dressings are given after each graze or cut, with the last application in mid-September.

In each of the last five years, 50 acres have been top dressed with 3 cwt Nitro-Chalk per acre between 20th August and 15th September, and in every year a profitable response has been obtained. In each of the last three years over 50 tons of fertilizer have been used on the farm and the net cost has averaged over £9 per acre. The actual quantity used in 1961 was 16 tons C.C.F., plus 6 tons KayNitro, plus 31 tons Nitro-Chalk.

Controlled grazing

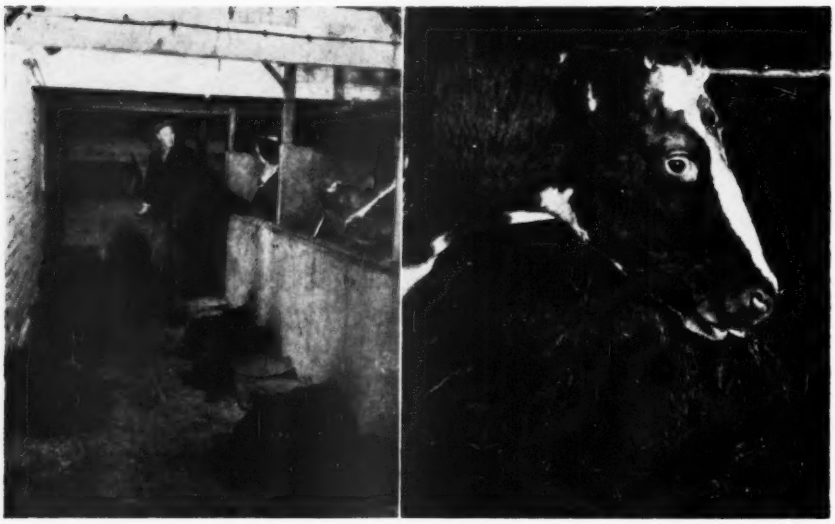
The electric fence is moved twice a day throughout the grazing season. Back fencing is used on the largest field of 8 acres, but otherwise it is unnecessary because of the small size of the fields. Whenever necessary the herd is grazed in two groups so that the very best grass is reserved for the highest yielding cows. But all stock, including dry cows, are always grazing good quality grass.

Grazing from the direct reseeds is available from late June, and its use is planned so that the dairy herd gets at least one feed a day of 'maiden' seeds from late June to late November.

Conservation

No hay has been made on the farm for some years; all the winter fodder is conserved as silage—in 1961 over 600 tons. It is made in two cuts—one in late May/June and the other in late July/August. Each cut takes about two weeks. The grass is ensiled in a covered silo, 63 yards long and 6 yards wide.

The technique of silage-making that has been evolved shows that it is not necessary to spend large sums on machinery. At Well Heads there is one forage harvester, one trailer and two tractors. In 1959, when 500 tons was made, there was only one tractor. Thus silage-making is a comfortable two-man job and in times of stress it can be managed by one man.



March, 1955. *Silage dumped in weighed piles alongside the stalls and then forked over to the cows at feeding time (left).* **March, 1961.** *Silage self-fed; feeding is controlled by means of an electrified bar (right)*

Livestock and feeding policy

The dairy herd is mixed Ayrshire and Friesian, and all cows are kept in the herd as long as they are profitable. The oldest animals are now in their eighth lactation. No rearing is practised, all replacements being bought in the local market. The herd calves in two batches—25–30 in late May/June and the remainder in late August/September. The cows are loose housed and milked in a two-level, three-stall tandem parlour. Milking is a one man job.

In feeding, the emphasis is to make the maximum use of grass, the cheapest possible food for the dairy cow. This results in a considerable saving in the feeding of the more expensive concentrates. Grazing in very early spring is not possible, owing to the elevation and climatic conditions; normally it starts in late April. However, by appropriate fertilizer dressing, the grazing season has been significantly lengthened in the autumn. In each of the last six seasons full day and night grazing has been possible until late October and full day grazing (with the help of kale) until the end of November.

When full grazing is established in the spring, concentrate feed is cut out completely, except for 1 lb per cow per day—given to act as a carrier for minerals—which includes 2 oz of granular calcined magnesite.

All cows are steamed-up on grass, but new calvers receive up to 2 lb of supplementary feed per day, again only to ensure full mineral intake. This level of feeding is not exceeded until late August, when new calvers get a maximum of 8 lb per cow per day.

The cows begin self-feeding silage at night in early November and are usually on full self-feed from early December. In the winter, supplementary feed is given at the rate of 2 to 2½ lb per gallon, with a maximum of 8 lb per cow, except for the occasional November calvers which may receive up to 12 lb per day. In the summer and autumn the supplementary feed is all

starch. In the winter, some high protein is introduced but last winter only 10 cwt of ground nut meal was fed.

The peak level of milk production on the farm is in the autumn, and the very high contribution made by autumn grass in 1961 is shown in Table 1. The low rate of concentrates will be noticed, and the table also shows that milk quality is very satisfactory.

TABLE 1

	Milk production		*Supplementary feed*		*Analysis bulk milk*		
	Total	Av. daily (gal)	Av./day cwt	lb gal	% Fat	% S.N.F.	% Total solids
5 weeks ended Sept. 2nd	5,320	152	·58	·43	3·65	8·73	12·38
4 ,, ,, Sept. 30th	6,300	225	2·57	1·28	3·70	8·85	12·55
4 ,, ,, Oct. 28th	6,216	222	3·27	1·65	3·80	8·80	12·60
5 ,, ,, Dec. 2nd	6,790	194	3·45	1·99	3·75	8·84	12·59

Throughout the period the cows in milk averaged over 3 gallons per day, and the supplementary feed was practically 100 per cent rolled barley. Minerals, including the 2 oz per day of granular calcined magnesite, are fed throughout the grazing season. This practice was started in August, 1958, since when there has not been a single case of hypomagnesaemia. The true herd average in 1961/62 was 819 gallons per cow, and the simple average of bulk milk analyses for the period was 3·8% fat, 8·7% S.N.F., and 12·5% total solids.

Increased profit margin

The farm has been fully recorded since 1948, and Table 2 on p. 390 shows the increase in milk output over the years.

Early-bite ryegrass ley on Well Heads Farm. In the background can be seen the new building which was made by extending and altering the old Dutch barn silo and lean-to

TABLE 2

	YEAR ENDED JANUARY			
	1948-49	1955-56	1959-60	1961-62
Total acres	73	85	85	85
Average number cows	44	44	59	64
Average yield cow—gal	671	729	743	819
Total milk production—gal	29,790	32,349	43,877	52,377
Supplementary feed—				
Starch	0·5	0·9	1·5	1·7
D. Cake and H. Protein	2·9 } 3·4	1·2 } 2·1	0·3 } 1·8	0·2 } 1·9

The increase in milk output is due not only to increased cow numbers but also to a higher yield per cow. The latter has been achieved with a considerable reduction in the rate of concentrate feed, particularly of the more expensive dairy cake.

TABLE 3

Milk costs and returns

	YEAR ENDED JANUARY			
	1948-49	1955-56	1959-60	1961-62
	pence per gallon			
Average receipts	31·50	39·93	37·54	34·50
Food costs—				
Purchased	7·87	8·42	5·26	5·90
Grass and silage	6·97	11·14*	11·41*	9·40*
TOTAL FEED	14.84	19·56	16·67	15·30
Margin over feed cost	**16·66**	**20·37**	**20·87**	**19·20**

*includes a small charge for kale

The drop in average receipts over recent years emphasizes the necessity for reducing costs if profits are to be maintained. The biggest single item in the cost of milk production is that of feed—over 60 per cent of the total. Table 3 shows that Mr. Barraclough has been able to maintain the margin over feed despite the drop in milk prices. It must be emphasized that the cost of grass and silage includes the rent (which in 1961–62 was £5 14*s.* an acre), a net fertilizer cost of £9 10*s.* an acre, and all the overheads and other charges such as labour and machinery costs for making silage.

Comparing the figures for 1961–62 with those for 1955–56, the average receipts have dropped by nearly 5½*d.* per gallon, but the margin over feed by only 1½*d.* per gallon, whilst milk output has increased by over 20,000 gallons. By his policy of intensive grass production based upon increased fertilizer usage Mr. Barraclough has successfully met the challenge of the times.

I.C.I. have made a 16 mm colour film of Mr. Barraclough's farm, 'Progress on Pennine Farm', which can be freely borrowed from their Films Division

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Mr. Glyn Williams, B.Sc., is the Senior Agricultural Development Officer of the Northern Region of I.C.I.

55. Pocklington, E. Yorks

J. White

THE Pocklington district extends from Stamford Bridge to Huggate in the north and through the Vale of York to within five miles of the River Humber in the south. It is predominantly an arable area, although there is some grassland farming on the heavier and poorly-drained soils in the southern end of the district and on the better drained but difficult-to-work belt of lias clay which separates the sands of the Vale from the chalk soils of the Yorkshire Wolds running down the eastern boundary.

The district includes the highest parts of the Wolds where they rise abruptly out of the Vale of York to 800 ft before descending more gradually in an easterly direction towards Driffield and the coast. Here the farming follows a comparatively simple system and, from the original four-course rotation, the main development has been a steadily increasing proportion of corn as the potentialities of this policy have been realized. The only new crop of any significance is seed potatoes which, to a small extent, have replaced turnips and swedes.

Life is not quite so simple on the sandlands below, which occupy two-thirds of the district and seldom rise above 50 ft. Here drainage is always a problem and wind erosion causes appreciable damage each spring. The area is dominated by a fairly complex farming system, where success is more dependent upon the farmers' ability than the soil itself, which is mainly post-glacial sand. This sand, which over-lies keuper marl, is often adulterated by morainic deposits and most farmers have to contend with a variety of soil types.

Before 1850, this area of sandland was described as an unpromising tract of poor blowing ferruginous drift, chiefly covered with ling and furze, where all attempts at cultivation had been abandoned. The discovery of marl beds beneath the sandland led to more successful attempts at reclamation, and 15,000 acres were under cultivation by 1870. The benefits of marling carried out 80 years ago can still be seen today, although the applications seldom exceeded 150 tons per acre. In the prosperous period after the 1914–18 war, and again during the 1939–45 war, extensive areas were marled and the practice is still followed, although the amount now marled seldom exceeds 50 acres a year.

Despite the undoubted benefits of marl to the texture and acidity of these soils, drainage has played an even more important role in their cultivation. Tile drains have to be laid with little or no fall and with outlets by way of ditches and Drainage Board dykes into the Rivers Derwent and Ouse. Records prior to 1870 showed that the road between Market Weighton and

Holme-on-Spalding-Moor was a track boarded on both sides by treacherous swamps. Today, Holme-on-Spalding-Moor is the largest arable parish in England, extending to 10,000 acres.

There is very little dairying in the area, mainly because these light soils are liable to dry out in the surface regions. Unfortunately, in spite of this surface drought in the summer, the water-table is held very high throughout the winter, largely due to the underlying beds of keuper marl. This has prevented the successful growth of lucerne, which would be so valuable to the dairy farmer in overcoming the dry conditions which prevent him stocking at the intensity now required for reasonable profitability.

Although it holds the winter rains near the surface, the marl itself does not contain sufficient reserves of water for irrigation purposes. Bores would have to extend through the beds of marl to a depth of 350–400 ft into the underlying triassic sandstone before water could be obtained in adequate quantities, and even at this depth the supply might well be too heavily mineralized for satisfactory use. Fortunately, the marl also prevents the drought from extending too deeply into the soil, and sugar beet in particular can usually find sufficient moisture to produce a first-class crop, even in the driest of years.

The prosperity of the area in the past has depended upon potatoes, carrots and sugar beet, with stock playing the relatively unprofitable part of converting straw into farmyard manure. Consequently the general standards of farm buildings up to the advent of the Farm Improvement Grant were poor. At one period little more than one-third of the farm devoted to cash roots was sufficient to carry the rest of the acreage, but today the picture is very different. Carrots, always a gamble, are facing ever-lengthening odds, and the market is tending to discriminate against the quality of potatoes grown on these soils. Fortunately sugar beet has more than maintained its level of profitability, and varieties of cereals are now available which are capable of cropping very well on these lighter soils. Cereals no longer play the role of a 'Cinderella' depending largely upon residual fertility from heavily-manured root crops, and the amount of nitrogen applied for corn has doubled in the last ten years.

Wind erosion is still a problem in isolated pockets where the sand is extremely light and where no marl has come sufficiently near the surface to make its application economical. Sugar beet and carrots suffer most damage. This year, in particular, many crops were blown out twice—the second time too late to be satisfactorily re-drilled. It is not only the land which blows which suffers, but also the land on to which it blows and very often the ditch into which it finally settles.

The established system of beef production was the leisurely progress towards beef of purchased stores (mainly from Ireland), both off the grass and out of the yards. There is now a great interest in the more intensive forms of beef production and many farmers are experimenting with systems of concentrated feeding from the calf stage to the finished animal at a year old. The beef animal offers considerable scope for increased returns and it is essential for this potential to be realized if the lightland farmer is to maintain his recent levels of profitability.

Before finishing this article, I showed the draft to a farmer friend. He felt I had painted a rather poorer picture of the sandland area than really existed. As he drove away in his new 3·8, I thought perhaps he was right and how nice it must be to own 500 acres of this one-time ferruginous drift.

M. F. TILLEY
Agricultural Land Service, London

Potato Chitting Houses

THE recently introduced technique of chitting potatoes by artificial light has been made possible by the invention of fluorescent light tubes, which produce a light nearer to daylight than the tungsten bulb, and also distribute that light more evenly over a wider area. Per unit of electricity consumed, they also produce more light and less heat than a tungsten bulb. They are therefore more economical to use, though costlier in capital outlay.

Practically any building which is structurally sound, weatherproof, and has a sound and level floor can be used for chitting potatoes by artificial light, provided it will house the tonnage required. In this connection potatoes are best stacked at the rate of 70–80 trays per ton, using rather more trays than is common in a glasshouse. From this and the size of the trays, the storage capacity of a building can easily be worked out. Allowance must also be made for alleyways between each pair of stacks of trays. These are for the lights and for day-to-day inspection of the sprouts, and should be from 1 ft 6 in. to 2 ft wide. Narrower alleyways will make inspection difficult; wider ones will reduce considerably the intensity of light falling on the potatoes. Allowance should also be made for a fairly wide alleyway or working space at the end of the stacks.

The building must be made frostproof, either by providing sufficient insulation or by using artificial heat. This must be a balance between capital and running costs; the higher the degree of insulation, the less frequently will artificial heat be needed to protect the potatoes from damage. Both the potatoes themselves and the chitting lights produce a considerable amount of heat, and in a well-insulated house these, between them, should provide sufficient protection against all but very severe and prolonged frost. The fact that the lights are being used for this purpose early in the season before chitting has started will not affect the potatoes, provided the temperature of the store is kept low enough. Under these conditions the eyes of the potatoes have not yet opened, and it doesn't matter whether they are kept in light or darkness.

All windows and skylights in an existing building should be blocked up and made light-proof. Some farmers prefer to use existing sources of natural light, arguing that this will reduce the number of fluorescent lights required. This is seldom satisfactory, as it is virtually impossible to maintain adequate control over the amount of natural light falling on the potatoes. This leads to uneven and irregular chitting, which defeats the whole object of the exercise.

During the early part of the season the temperature in the chitting house must be kept low (usually slightly below 40°F) to prevent premature sprouting

of the potatoes. This is generally done by the manual control of doors and other ventilators, some of which are best placed high up near the ceiling to disperse excessive heat. But this is not a very satisfactory method. It usually leads to wide fluctuations in temperature as well as the risk of frost damage, and many man-hours are wasted in achieving even a moderate degree of control. The best way of ensuring adequate temperature control is by means of electric fans coupled to differential thermostats with an over-ride frost thermostat. The differential thermostats can be set so that, whenever the store temperature rises above external temperature by more than a set amount, the fan is switched on and stays on until the inside temperature is lowered. The over-ride frost thermostat stops the fans being switched on during frost. Control is thus entirely automatic and takes advantage of any slight fluctuation in external temperature to lower the store temperature without risk of frost damage. The store temperature can be raised as desired by altering the settings of the thermostats. Nor is this method of control expensive. An 18 in.-diameter fan, costing about £35, will provide the necessary 20 air changes per hour for a room of nearly 7,000 cu. ft capacity which will house 16–20 tons of potatoes in chitting boxes. The differential thermostat will probably cost another £30–50, and it may well be necessary to install some air-ducts to ensure complete dispersal of fresh air throughout the store. This expenditure will, however, quickly be recovered by the saving in labour.

The fluorescent lights must be of the 'warm-white' variety and are hung vertically between the stacks of trays so that they can be moved opposite a different set of trays each day. For maincrop potatoes, one such light is usually provided to each 12 stacks of trays (6 each side of the alleyway). Early varieties of potatoes need almost double this quantity of lights. Proprietary chitting light units can be bought or they can be made up by a local firm of electricians. In either event they should be installed by a qualified electrician. It is not worth trying to save money by doing the job yourself; the risks of failure or accident are too great. As the lights are brushed against regularly by the person moving them or inspecting the potatoes, they should all be earthed. With small stores (say, up to 40 tons capacity), the daily task of moving the lights is not great. For larger stores, it is worth considering suspending the lights on some form of tracking—sliding door tracking is excellent for this purpose. Then all the lights can be coupled together with a length of stout cord and moved in groups, one whole alleyway at a time, simply by pulling on the cord at one end.

If an existing building can be converted in this way for potato chitting, the cost (including all the electrical equipment) will probably be about half the cost of a glasshouse of similar capacity. A completely new artificial-light chitting house will, however, cost rather more than a glasshouse. On the other hand, the maintenance costs on a brick and asbestos roofed building will be considerably less than on a glasshouse, and it will more easily be converted to other uses out of season. In season, if properly built and managed, it will also provide a higher degree of control over the rate of chitting than can be obtained in a glasshouse, with less risk of frost damage.

Conservation of Water for Agriculture

Reported by ***Sylvia Laverton***

IN his talk to the Farmers' Club on 10th October, LORD DE RAMSEY, Chairman of the Executive Committee of the Country Landowners' Association and one of the Minister of Agriculture's personal liaison officers for the Eastern Counties, before discussing water conservation in relation to farm irrigation, emphasized the importance of good drainage. 'I am convinced' he declared, 'that on most soils it is more important to have the right amount of air than the right amount of water; this is most important of all in summer when irrigation takes place'.

The Ministry of Housing and Local Government has been responsible for the nation's water supplies and for water conservation since 1848, but nothing very positive was done until the Water Act of 1945 restricted the extraction of ground water in certain parts of the country, except under licence, in order to combat the growing water shortage. Surface extraction remained uncontrolled, but since the development of spray irrigation, in which little or none of the water taken from surface sources finds its way back, the need for further conservation measures has become obvious. In an area already short of water, irrigation, even on a small scale, would dry up supplies. 'If only 3 per cent, or say 1 million acres of land in Britain were irrigated with 4 acre-inches a year, a vast quantity of water would be consumed in a matter of weeks—some say as much as the whole domestic consumption in a year. Even if only half this acreage is irrigated by 1980, it may well be that the demand for irrigation water, combined with other demands for domestic and industrial use, will exceed supply unless stringent methods of conservation are adopted.'

A Water Conservation Bill is expected in the forthcoming session of Parliament—'provided time permits', said Lord de Ramsey. This legislation is likely to decentralize responsibility to the new river authorities, who will co-ordinate the demands for water and development of resources, and will take over the functions of River Boards. Some sort of three-tier system of charges for water is expected. Most probably there will be a licence fee, payable for surface as well as ground water, a basic charge to all abstractors of water, and an additional charge for water produced by conservation works. The initial fee might not exceed £5, the second-tier charge might be 1*d*., 2*d*. or 3*d*. per thousand gallons (approximately 2*s*., 4*s*. or 6*s*. an acre-inch).

Many farmers would object to this second charge, he said, taking the view—quite wrongly—that water flowing through their land should be free. 'The fact is, that under the Common Law, the riparian owner can take water

for domestic and agricultural purposes, but he must return it substantially undiminished in quantity and unaltered in quality.'

The three-tier charge, which must vary according to the cost of the conservation work involved, might be anything from 3*d.* to 2*s.* per thousand gallons (6*s.* to 48*s.* an acre-inch). Experience in these matters is very limited, hence cost estimates for conservation works must be very tentative. 'It is hoped that, before engaging in conservation works, the new river authorities will be careful to consult all their customers, especially their farming customers', said Lord de Ramsey, 'so that they do not produce water which is too expensive to use'.

He then described the 'different types of holes' that may constitute farmers' own conservation works. The balancing reservoir with a penstock, used with the gate up, can mitigate a flood, and with it down will provide water for irrigation, but in practice is only too likely to be empty when water is wanted and full when it should be got rid of. The impounding reservoir, constructed on or adjacent to rivers or streams, collects and stores water for use during periods when the discharge of the stream decreases, or has fallen below the determined rate at which abstraction is permitted. When conservation orders apply or other users' interests have to be safeguarded, water can be diverted for storage only when the flow exceeds a predetermined discharge, and in some cases compensation water may have to be discharged.

The capital costs of irrigation schemes requiring an impounding reservoir vary enormously. Costs are affected by the size of the reservoir, which is determined by the flow characteristics of the stream, the period for which irrigation would rely entirely on a stored water supply, and by the topography of the reservoir site. The cost per acre-inch of storage in any particular reservoir depends on the geology and topography of the site, which determines the design and construction of the reservoir; and also on the flow characteristics of the river and the conservation authority's requirements, which largely determine the construction of intake, regulating and overspill works. In permeable subsoils, construction costs are three to five times greater than for a normal earth-embanked reservoir, and economic only for high-value horticultural crops.

From cost analysis of some recently constructed reservoirs, Lord de Ramsey said that for reservoirs ranging in capacity from 1 to 5 million gallons (44 to 220 acre-inches), the all-in rate for excavation varied from 2*s.* to 4*s.* per cubic yard, the cost of excavation per million gallons stored varied from £340 to £1,200 (i.e., £7 12*s.* to £27 per acre-inch) and the gross cost per million gallons stored from £450 to £3,700 (£10 to £83 per acre-inch stored). Omitting the high-cost horticultural reservoir, the average cost would be about £350 to £600 per million gallons for excavation and the gross cost £500 to £1,000. Interest and maintenance charges are not allowed for in these figures.

Further cost is incurred in getting the water to the place where it is used—diesel pump sets cost from £350 to £800; pumping from boreholes may cost even more. If mains are needed, portable ones cost from 2*s.* a yard for 3-inch pipe to 45*s.* a yard for 6-inch pipe; permanent mains have the advantage of qualifying, at present, for a Ministry grant.

Summing up, Lord de Ramsey said that we cannot long defer practical action on water conservation. Irrigation is one means of getting the best value from farming operations—but we must make quite sure that any work done will produce an economic return.

IN BRIEF

Pests or Plenty

Pests or Plenty is the title of a new film made by Shell Chemical Company dedicated to the problem of increasing crop yields by using up-to-date methods of chemical control while attempting to reduce the hazards which some of these chemicals present to wild life. It is presented within the framework of a triangular debate between a farmer, an entomologist and a nature-lover. The farmer whose crops have suffered severe damage from insect pests has no doubts about the need for using chemical control. But the entomologist wants to preserve the useful species of insects, pointing out that of the twenty thousand kinds in Britain, only a few hundred are serious pests. The nature-lover feels we have a duty to preserve the birds and wild life of these islands. While conceding that harmful pests should be killed, he, like the entomologist, would like to be sure that the killing is selective.

All three are in agreement that, though necessary, farm chemicals must be applied carefully so as to reduce the risks to wild life.

The narrator sums up: 'The world's need for food gets greater every year, and with it, the need to fight pests. We're all agreed on the ideal control to aim for, but it isn't going to be achieved overnight. In the meantime, if we're to save our crops, we've still got to fight the pests—with the best means at our disposal. We can save our crops *and* our countryside if farmer and nature-lover, chemist and entomologist work together.'

This film, in colour, runs for 17 minutes, and can be borrowed free from the film section, Public Relations Department, Shell Chemical Co. Ltd., 170 Piccadilly, London, W.1.

Only One Grease Gun

Ask anyone who has to service agricultural machinery and implements what his greatest annoyance is, and the answer could very well be the constant changing of grease guns for different nipples. So many types of lubricating nipples are in use today that one grease gun will not fit them all. The result is waste of time and money.

But there is to be a change. Following demand by both manufacturers and users, the British Standards Institution has now recommended a standard (B.S. 3498) which should limit the variety of nipples on new machinery to such an extent that one grease gun will be sufficient for all lubrication.

This standard will help everyone, from the designer of agricultural machinery down to the user. What is more, the standard is to be used as the basis of a British proposal for the international standardization of this type of nipple.

The nipples are of the hydraulic type with screwed or press-fitted spigots. Only two sizes of screw threads are specified. There are four main designs of threaded nipples—the straight type and three angled designs having heads of 45°, 67½° and 87½°. The standard provides for three different profiles of head; the press-fit nipples are of one design only.

Copies of this standard may be obtained from the B.S.I. Sales Branch, 2 Park Street, London, W.1, price 5*s*. each. (Postage will be charged extra for non-subscribers.)

Field Systems

Field patterns in many areas are survivals from the past, designed for systems of livestock farming back in the early Middle Ages. A report recently issued by the Department of Agricultural Economics of the University of Exeter considers the costs and benefits of reorganizing the field plan of such a farm in Devon, and because the problem is not an isolated one, it has more than regional significance. The authors of the report recognize and list the arguments for their continuance, but they also show that such fields fail to meet the present-day needs of mechanization and rising costs of maintenance.

In 1956 the West Country farm in question consisted of 130 acres, divided into 38 fields separated by the familiar Devon earthbanks, topped with quickthorn, hazel and a few trees. Twenty of these fields were under 3 acres and only five over 5 acres, the average size being 3·1 acres. Today there are only nineteen fields, ten of them over 5 acres each, and the average size is 6·3 acres. The number of fields has been halved and the average size of fields doubled.

The total cost of this work to the farmer was £191, which income tax relief reduced to £113. He did not apply for a grant under the Farm Improvement Scheme, but if he had obtained such a grant his net expenditure would have been only £78. The benefits he secured cannot, of course, be calculated so precisely. But the speed and efficiency of field cultivation were greatly increased—the amalgamation of three fields into one, for instance, reduced the number of reverse turns in starting harvest from sixty-six to eight—and the labour of maintaining hedges was substantially decreased. In terms of man-hours, the report estimates, the net saving was about half a full-time man.

More practically, the change has enabled the farmer, with a small increase of casual and family labour, to run the farm as a family holding after his only farm worker left and yet expand his tillage area from 31 to 44 acres. In addition, by removing the hedges, he has secured a little more productive land and finds that his corn ripens more evenly and his hay dries more quickly.

The title of the report is *Some Physical and Economic Considerations of Field Enlargement* (E. T. Davies and W. J. Dunford), and it is obtainable from the University, price 3*s*. 6*d*.

Nigel Harvey

New College of Agricultural Engineering

To meet the growing need for qualified agricultural engineers, a matter of tremendous importance for the continued progress of the British agricultural engineering industry, a new college, The National College of Agricultural Engineering, is being built at Silsoe, in Bedfordshire. Thirty-seven acres of nearby farmland have also been bought for experimental and practical work.

The new Foundation is sponsored by the Ministry of Education and controlled by a Board of Governors (Chairman: Sir Gilbert Fleming, K.C.B.). The Ministry of Agriculture has been closely associated with the Ministry of Education in planning this college, and has appointed Mr. A. B. Bartlett to the Board as an assessor. The Principal of the College is Dr. P. C. J. Payne, formerly of the Department of Agricultural Engineering, Durham University.

The main course at the College will prepare for agricultural engineering at professional level and will normally occupy three years of full-time study, leading to the award of the College Associateship. Qualifications for entry are in most cases similar to those for degree courses in engineering, although greater diversification can sometimes be allowed. It is also intended to provide shorter advanced courses, probably of one year, for students who have already obtained a degree or the equivalent in engineering or agriculture.

The College is opening this autumn with a small group of students in temporary premises made available by the Ford Motor Company.

It is hoped that some of the new buildings will be ready for occupation by the autumn of 1963. It is intended to provide in the first instance teaching accom-

modation for up to 100 students. The residential accommodation will be arranged in two hostels, each with 50 single study bedrooms. Later it is hoped to add two more similar hostels.

The agricultural engineering industry has undertaken to supply the College with farm machinery to the value of £50,000, and to maintain and keep this equipment up to date; the industry is also making other donations such as scholarships.

How Important is Cobalt?

Unthriftiness in cattle and sheep due to lack of cobalt has been recognized in various parts of the world for many years. In Britain, 'pining' areas, with all the classical symptoms, are found in the Hebrides, the Cheviots and in Devon. But the author of a recently published booklet* suggests that unsuspected borderline deficiencies may prevent stock from attaining their full potential, and that poor do-ers may in many cases respond to cobalt. In four chapters, each averaging 10 pages, he discusses deficiency diseases in general, the physiological necessity of cobalt for ruminants, reasons for cobalt deficiency in the environment and, finally, means of treatment.

Food in the rumen is digested by swarming myriads of bacteria and protozoa, which together may account for one-fifth of the solids present; but the development of the bacteria depends upon a supply of cobalt from which they make the essential vitamin B_{12} (cobalamin). Protozoa cannot make this but depend upon what is excess to bacterial requirements, and the first sign of deficiency is a drop in the number of protozoa. As protozoa provide a high-quality protein for the host animal, the failure in supply may be a factor in poor doing. Other issues such as infertility due to failure of the fertilized ovum to become implanted, are discussed in relation to cobalt deficiency.

The author prefers to assess cobalt status from the plant rather than from the soil, as available cobalt in the latter may bear little relationship to the total. Although the following table is supplied, a warning is given that the needs of cattle may have been underestimated, particularly as regards gestation and lactation.

Parts per million of plant dry matter	*Degree of deficiency*
0·01	Extreme. High death-rate in sheep and cattle.
0·01—0·04	Acute in sheep. Some wasting in cattle.
0·04—0·07	Deficiency in sheep, but although insufficiency in cattle there are no serious symptoms.
0·07	Lowest limit of apparent health in both species.
0·1—0·3	Progressive increase in productivity.

For direct administration to the animal, cobalt either as sulphate or chloride is suitable. It may be given at the rate of 5–10 mg of either salt per gallon of drinking water (the higher rate when the ration is succulent—grass or silage—the lower with dry feeding). If cobalt bullets are used, one should be given at weaning, one at a year old, one at two years, and thereafter one at six-monthly intervals. The rate to be added to concentrates, if this be the route, is 5g of the sulphate per ton.

The best means of applying the mineral to the land is to incorporate cobalt salts in superphosphate. For ordinary soils, an annual application of 6 oz of the sulphate per acre is suggested in this form. On light soils or in regions of heavy rainfall 9 oz is preferred, and 14 oz on alkaline soils. In the latter case the application should be only every second year until the pH is low enough to allow the smaller annual dressing; damage to plants is thus avoided.

The booklet is free from the London office of the Centre d'Information, Chichester House, 278 High Holborn, W.C.1.

S. M. Boden

**Cobalt Deficiencies and Sub-Deficiencies in Ruminants.* Dr. J. P. Latteur.

Books

Farming and the Law. EWAN MITCHELL. Farming Press (Books) Ltd. 25*s*.

The author who sets out to write a treatise on a technical subject—whether it be the law, medicine, or economics—in non-technical language, capable of being understood by the general reader, is at once faced with a quandary.

Shall he attempt to cover the whole field of his subject so that the reader may find some reference, however brief, to the problem which is puzzling him; or shall he, on the other hand, select a relatively few problems of general interest, adopt a more discursive style and, by explaining the general principles which have to be applied in a particular case, leave it to the reader on his own to solve other problems not dealt with?

Whichever way he decides the result can never be entirely satisfactory, since the first alternative, by sheer condensation, is all too apt to mislead, while the second may result in the reader feeling aggrieved that he cannot find what he is seeking.

The author of *Farming and the Law* is a barrister on whom professional etiquette has imposed the nom-de-plume of Ewan Mitchell, and he has opted for the second alternative. Each chapter raises a specific legal problem with which a farmer might find himself confronted. Then in the form of a racy and often witty duologue between Sam Stock, a farmer, and Rex Bailey, his solicitor, the problem is analysed, the principles of law explained and the solution indicated.

The author is to be congratulated on the apparent ease with which he is able to explain simply, lucidly and accurately points of law which are often far from easy for even a lawyer to grasp. If, to attain this, the style of the duologue tends after a while to become monotonous, and the humour a little laboured, this can be excused on the grounds that the book is manifestly not intended to be read at a single sitting.

One might cavil also at the slightly patronizing tone which the author appears to adopt towards the farming community, who are represented throughout in their familiar image as 'hay seeds', rather than (as experience shows them in fact to be) hard-headed business men not so very different from their city counterparts.

Should there one day be a second edition of this book, a minor correction might be made in the chapter on 'Payment of Wages'. The Orders of the Agricultural Wages Board prohibit (as they have for many years) the reckoning of benefits and advantages which are not defined as such in the Board's Orders. Consequently, the farmer should not be misled into thinking that he may make reasonable deductions for undefined benefits, leaving it to the Court, if necessary, to fix their value. If he does this he runs the risk of under-paying his workers and of committing an offence against the Agricultural Wages Act, 1948.

The book can be safely commended as an introductory volume to anyone who seeks to grasp the principles of our law, whether he be farmer, land agent, or law student. If, after reading it, he continues to regard the law as 'a hass' he has only himself to blame.

G.F.A.

Plough and Pasture: The Early History of Farming. E. CECIL CURWEN and GUDMUND HATT. Collier. 7*s*. 6*d*.

This is in fact two books in one. The first is a mainly archaeological account of the origins of western agriculture, telling how it gradually spread through the Middle East and later to the farthest corners of Europe, including Britain. The second describes the farming practices of primitive peoples outside Europe and draws largely on anthropological sources. Both parts are full of interesting sidelights on man's constant struggle to keep himself alive, and they leave the reader much to speculate on.

By what dangerous process of trial and error did the Australian aborigine discover the elaborate treatments needed to turn poisonous plants into edible food? Why was the use of dung, so highly prized by the rest of mankind, abhorred by the Maoris? Why was the pig used in the Nile Delta to thresh grain by trampling where everywhere else it was reared as a food animal?

The authors have attempted much in a small compass, and, with so much to beguile, it is no discredit to them if they have not entirely succeeded.

Like most potted histories, both parts suffer from what has to be put in and what left out. In places the information is packed so tightly as to become almost a catalogue; in others, the treatment of important systems—for example, the medieval open fields—tends to be summary and routine. Nor is the balance always kept between arable and pastoral. Reaping and threshing have a whole chapter; so have the drying and milling of grain. But the early dairying processes are scarcely mentioned; and neither is sheep-shearing.

And in a book which brings British agriculture nearly to modern times, it is a little surprising to find no reference in the list of authorities to, for example, Hoskins on the village, Trow-Smith on farm stock, or Fussell on implements.

G.L.W.

The Semen of Animals and Artificial Insemination. Edited by J. P. MAULE. Tech. Comm. 15., Commonwealth Bureau of Animal Breeding and Genetics. 60*s*.

An excellent publication, this is a much amplified successor to—though it does not wholly supplant—the monograph of Anderson (1945). The material is arranged in what is obviously the natural way, by species. There are successive chapters on cattle, water buffalo, sheep, goat, pig, horse, mule, dog, rodents (including the rabbit) and poultry. The honey-bee and man are excluded, as is the artificial semination of fish eggs. There is an account of artificial insemination in the tropics.

A final chapter on the export of semen is informative and competent but presents a wholly British point of view in what is, after all, a book of international standing. The only reasons given for export are the national interest and '. . . to promote the use of British breeds abroad', while imports of semen, which from the foreigner's point of view are his exports, are 'not recommended'. The book closes with author and subject indexes, and there are some 2,000 references.

In future editions an improvement would be a final chapter underlining the problems most in need of further research, and integrating the results obtained with the different species. For instance, in cattle, there are reports of a positive relationship between fertility and the proportion of spermatozoa remaining unstained after subjection to certain dyes; but some investigators—perhaps because they have used a rather uniform selected population of particularly fertile bulls—find no significant correlation. In the rabbit, the staining method significantly predicts fertility, but only two experiments have been carried out. In a paper on sheep, the correlation is positive but not significant. Therefore one would have reservations about each species considered in isolation.

A comparative approach, however, could draw attention to the fact that the results in the three species all point in the same direction, thus supporting the higher-level proposition that the method of predicting male fertility may be *generally* applicable to mammals.

The main chapter of the book, on cattle, has a wide scope and constitutes a monograph in its own right. Rodents are dealt with rather briefly, perhaps because only the rabbit has some economic importance. On the other hand, rodents have been much used for the fundamental study of reproductive physiology, as the author of the chapter points out, and one would like to see more detail about researches that can be regarded as pilot experiments relevant to problems in the larger farm animals.

R.A.B.

The Book of the Country Town. E. W. MARTIN. Phoenix House. 12*s*. 6*d*.

If you are interested in local history and would like an introduction to the subject in light reading, try this book. Its title is rather inadequate, for it contains an excellent introduction into the real history of this country; not the boring facts of the Rump Parliament, but social history relating the story of the development of people in their settlements.

The rise of the country towns and of the great cities is traced from earliest times to the Welfare State of today, and the author weaves the growth of trade with the necessity for thought to be given to social amenities. The Reform Bill which we were made to read at school is here put in a different light, and we are reminded that, before 1832, the workers had no place in civic affairs. The reader is also introduced to the history of the recognition of public opinion; of men like Wesley, who had a new thought for the people and who reminded others that reform in thought was necessary in an era of change.

Most of the book is devoted to the development of the town in the nineteenth century, for that was the vital period when

local government was taking shape. It traces the early stalwarts of the educational system, the slow progress made in public health service, and the birth of local county councils which brought order into local government.

In describing the expansion of towns in the nineteenth century, it is inevitable that the author should emphasize how big men grew fat through the exploitation of women and children factory workers. This is well recorded and I hope may reach the ears of Mr. Dickens. *P.J.O.T.*

The Book of the Village. E. W. MARTIN. Phoenix House. 12*s.* 6*d.*

It is difficult to write a good, short book on a subject as vast and complex as the development of the English village. It is even more difficult to write it in a manner which attracts and holds the interest of 'older children'. Mr. Martin has tried very hard to do so, but he has not succeeded. The presentation is confused, and he has included much that should have been excluded, and excluded much that should have been included. For vivid simplicity, this book cannot compare with, say, the relevant chapters in Charlotte Waters' famous old *Economic History of England*, which was intended for the same kind of readers.

Nevertheless, Mr. Martin has assembled a lot of interesting material and made it available in a form suitable for both teachers and pupils.

In general, of course, the story he tells is predictable. Manors and open fields, squire, parson and schoolmaster, peasant and labourer, village crafts and local industries, all are there. But happily there is no repetition of the familiar golden legend of our rural past. We hear Bright and Hudson as well as Ditchfield on the landed gentry, while Tuckwell is called to support the inevitable Cobbett and Kingsley.

Perhaps the most valuable sections of the book for the general reader are those dealing with the village today and the part played in its life and economy by such bodies as the Women's Institutes and the Rural Industries Bureau, while teachers will particularly appreciate the final pages which list and develop possible subjects for discussion.

The illustrations are numerous and agreeable, and there is a useful little reading-list, though the latter would have been improved by the inclusion of Orwin's *Country Planning*, Robertson Scott's *England's Green and Pleasant Land* and the unique *Lark Rise to Candleford*.

N.H.

Food Buying: Marketing Information for Consumers. CARLTON E. WRIGHT. Macmillan. 51*s.*

This book on food marketing is unique in that it is written from the viewpoint of the consumer rather than that of the producer. It is aimed at anyone who buys food for a family or for a small institution, and is intended to make easier the task of buying, caring for, and preparing food. Although American, it will be of considerable interest to British readers.

In style, lay-out, and content, much of it is of the nature of a textbook, and it is doubtful if the British housewife will have more than a passing interest in the dozens of tables, charts and histograms with which the text is liberally illustrated. These do not make up for the lack of photographic illustration which would greatly enhance the value of the book. Perhaps the American home-maker is more statistically-minded than is her British counterpart. The book will be welcome to the American student reading food marketing, for its universal collection of facts will provide the basic material to answer many examination questions.

Food travels a well-defined path in the normal course of distribution from farm to kitchen, and this sequence is followed to present the various topics in logical order. Food production, transport and handling are described and discussed to show how the cost of food is apportioned in the chain of distribution and how special services and processes within this framework lead to higher costs.

American eating habits, and how they have been subjected to change in an increasingly affluent society, are shown in relation to food buying and home food preparation. There is a full discussion of price in relation to season and supply, quality, food value, convenience and storage.

Cost per serving is used as a basis for cost comparisons of various foods, both fresh and processed, of differing food values, buying units, grades and uses, and home-made versus already-prepared food.

Methods of stretching the food dollar are described: the means to this end are judicious planning of meals and shopping, comparisons of quality and price, the use to which food is to be put, buying in quantity, careful storage and proper food preparation.

A section of the contents dealing with frozen foods and the home freezer will be of limited interest in this country where only one home in four is equipped with a refrigerator and home freezers are even more scarce. *G.H.S.*

Breeder and Boffin. ALLAN FRASER. Crosby Lockwood. 9*s.* 6*d.*

As the author says at the beginning of this most interesting book, the breeding of farm animals is in a state of flux. This is the result of the interactions between the scientist and the conventional breeder, both of whom he commends and criticizes in turn.

The scope of the book may be judged by the headings of the chapters and something of what they contain. What the breeder has achieved has been done by crystallizing out breeds for special purposes from native stock under optimal conditions of soil and feed. These breeds have gone all over the world.

The methods the breeder has used have been sound scientifically but the targets he has aimed at have not always been right. The advent of mechanization has led to the demand for less fat in meat, but breeding for early maturity in fat development, together with the continuation of castration which increases fatness, has led to the decline of some breeds. Since there is no necessary relation between the speed of liveweight growth and fattening qualities, breeding objectives should now be quick muscular growth and slaughter at early ages.

There has been a canonization of pedigrees as such without corresponding performance, and many Breed Societies have paid too much attention to fancy, as compared with commercial, points. While many things, like a good farm and good feeding, help to make the 'Master Breeder', it is doubtful whether he has any sixth sense to guide him. Rather, it is the power of keen observation and having a dream animal to aim at that have made him what he is.

Can the breeder with a small number of animals and a short herd life survive in competition with the large numbers and continuity of A.I. methods? The answer is that there is always room at the top, and a system of royalties to the breeder on merit would meet this problem.

Where the boffin has succeeded is not so much in genetics but rather in the practical application of A.I. which has raised the importance of the sire. Mating him to close relations is the best test of his genetic worth. Where the boffin may blunder is in the methods used for making performance and progeny tests. Criticisms are made of present methods.

In conclusion, the author discusses how breeding should be carried out in the future by Breed Societies, Limited Companies, the State or Producers' Boards.

The book supplies plenty of material for thought and should be read by both breeder and boffin to their common benefit.

J.H.

Grower Annual 1962. 15*s.*

For a reference book to be of the greatest use it is desirable that it should be easily available for frequent consultation. In its new pocket size, the *Grower Annual* certainly meets this requirement.

Nearly a third of the pages are taken up with a 'Guide to the Control of Fruit Pests and Diseases', of which the first part deals with the points to be considered in planning a spray programme. This is well written and contains much valuable guidance which should be carefully read and digested by all fruit growers.

The stress given to the value of adequate records and the remarks on compatibility are praiseworthy. Attention is also called to the care needed in the selection of materials, both in relation to the use to which the fruit is to be put and to the hazards of toxicity.

The 'control charts' which follow, represent a brave attempt to summarize in diagram form the use of the wide range of fungicides and insecticides available, but it cannot be said that they are entirely successful.

The use of colour symbols, whilst eye-catching, is confusing, and it would probably have been better had these been replaced by the names of compounds, thereby allowing the tables to be spread to the full size of the pages.

As might be expected, an attempt to please everyone by the inclusion of a full range of compounds results in confusion and, indeed, in some debatable recommendations. All this information could have been given much more satisfactorily in verbal form, and there is no doubt that the author would have been capable of doing justice to this in the manner in which he has covered the remainder of his subject.

A.G.W.

A Bird and its Bush. MICHAEL LISTER. Phoenix House. 16*s*.

This is a practical guide for bird watchers which aims at showing that birds exist not *in vacuo* but in relation to animals, plants and physical factors; in short, it is a book about bird ecology.

The methods by which the birds' environment should be analysed and described are well illustrated but, as the author himself acknowledges, the subject is far too vast for adequate treatment in one book. It is rather disappointing, therefore, to find that two of the seven chapters are repetitions of chapters in *The Bird Watchers' Handbook* by the same author published in 1956. Even so, there are excellent accounts dealing with the salient features of such diverse subjects as geology, soil types, topography, zoogeography, climate and vegetation types.

Students of bird migration need to be well acquainted with weather systems and climatology. In describing such aspects as the mechanics of depression formation and how to read weather maps, a useful chapter has been created. No less valuable are the sections dealing with types of vegetation—extended in an appendix by W. B. Yapp—which should enable the serious worker to describe any bird habitat in Britain. For these fields the book should serve as an excellent reference work, and its usefulness is enhanced by the admirable choice of instructive photographs.

The remainder of the text deals with the relationship between birds and other animals, including man. These topics are dealt with by reference to a rather selective—and as a result slightly misleading—section of the literature, primarily British, with which most interested ornithologists should in any case be familiar. Thus the section on economic ornithology is incomplete and out-dated and the author makes no acknowledgment of the wealth of American work on the subject.

Apart from these flaws, Mr. Lister has accomplished a very difficult task, and most bird watchers would benefit from a close study of the material he has presented.

R.K.M.

ACKNOWLEDGMENT OF PHOTOGRAPHS

We gratefully acknowledge permission to use the following photographs:

pp. 360 and 361. R. A. Dunning; p. 370. Joan Pitt; p. 372. *Farmer and Stockbreeder;* pp. 386, 388 and 389. Imperial Chemical Industries, Ltd.

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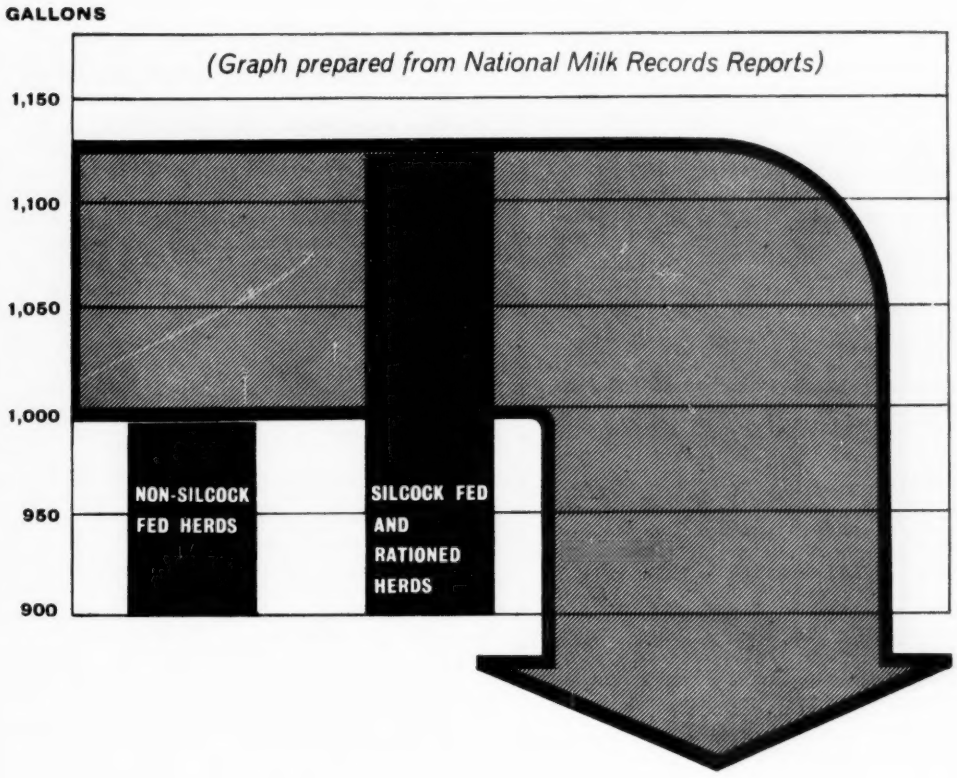
by Hull Printers Limited, Willerby, Hull, Yorks.

(K76) 72-1-62-11



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Applications are called for existing vacancies in the Department of Agronomy in the categories of Research Assistant and Technician.

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Applicants should have interests and/or experience in at least one of the following fields:—

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(b) plant growth in controlled environments (plant physiology);
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(b) pasture utilization,

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Applications, two copies, should be forwarded to reach T. C. Lamble, Registrar, University of New England, Armidale, New South Wales, Australia, by 30*th November, 1962*, and should include personal details, a statement of qualifications and experience, a recent photograph and the names of three referees. Applicants from the United Kingdom should forward an additional copy of their application to the Secretary, The Association of Universities of the British Commonwealth, Marlborough House, Pall Mall, London S.W.1, by the same date.

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